KEYSPAN GAS EAST CORPORATION
THE BROOKLYN UNION GAS COMPANY
NIAGARA MOHAWK POWER CORPORATION

DEPRECIATION STUDY

POTENTIAL IMPACTS OF CLIMATE CHANGE POLICIES AND LAWS

Prepared by:

GANNETT FLEMING

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NATIONAL GRID

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November 7, 2022

National Grid
300 Erie Blvd W
Syracuse, NY 13202

Attention: Mr. James Malloy
Vice President, New York Regulation and Pricing

Ladies and Gentlemen:

Pursuant to your request, we have conducted a depreciation study analyzing several gas planning scenarios for Keyspan Gas East Corporation ("KEDLI"), The Brooklyn Union Gas Company ("KEDNY") and Niagara Mohawk Power Corporation ("NMPC"; collectively all three companies are referred to as "National Grid"). The study sets forth a review of depreciation practices, potential impacts of climate change laws and policies, and provides the results of several depreciation scenarios that incorporate various assumptions regarding the path to decarbonization.

Respectfully submitted,

GANNETT FLEMING VALUATION
AND RATE CONSULTANTS, LLC

NED W. ALLIS
Vice President

NWA:jmr

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DEPRECIATION STUDY ON CLIMATE CHANGE POLICIES

EXECUTIVE SUMMARY

In the Order Adopting Gas System Planning Process in Case 20-G-0131 ("Gas Planning Order"), the New York State Public Service Commission ("New York Commission") ordered the New York gas utilities to prepare a study "that examines both the structure of accelerated depreciation and its potential impact on customers."[1] The Gas Planning Order directs utilities to file depreciation studies with the following scenarios: (1) a scenario that fully depreciates all new gas plant installed beginning in 2022 by 2050; (2) a scenario that fully depreciates all gas plant by 2050; and (3) a scenario that assumes 50 percent of gas customers exit the gas system by 2040 and that 10 percent of gas customers remain after 2050 (referred to as the "high electrification" scenario throughout this report).[2]

This report provides the results of the study performed for National Grid, including analyses of the potential impacts of these issues.[3] The analyses and conclusions set forth in herein incorporate the potential impacts of New York's Climate Leadership and Climate Protection Act ("CLCPA"), including scenarios that incorporate declines in both sales and customers as set forth in the Gas Planning Order. This report also analyzes additional potential depreciation scenarios not specifically required by the Gas Planning

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[1] Case 20-G-0131, Proceeding on Motion of the Commission in Regard to Gas Planning Procedures, *Order Adopting Gas System Planning Process* (issued and effective May 12, 2022) ("Gas Planning Order"), p. 61
[2] *Id.*
[3] Note that while several depreciation approaches have been analyzed for this report, the results should not be construed to mean that National Grid endorses or accepts any of the specific depreciation scenarios set forth in the report.

Order, including the Medium Electrification – Clean Energy Vision ("CEV") scenario. This CEV scenario is consistent with National Grid's Clean Energy Vision,[4] described in more detail in the Appendix of this report. The CEV scenario incorporates a more moderate decline in gas throughput and the number of gas customers than the high electrification scenario established by the New York Commission in the Gas Planning Order.

Depreciation is both an expense and a deduction to rate base. An analysis of depreciation scenarios should, therefore, consider both short- and long-term impacts. This report includes projected costs and bill impacts for each year through 2050 (the target date for emissions goals set forth in the CLCPA) resulting from the various scenarios analyzed. Estimating these projected costs – including future depreciation expense, revenue requirements and bill impacts – requires developing two key sets of input assumptions. The first, referred to as business assumptions in this report, includes assumptions about future gas throughput and customer counts. The second, depreciation scenarios, incorporates the different depreciation approaches modeled in the analyses. Different sets of business assumptions and depreciation scenarios combine for the analyses and, as shown herein, each of these sets of assumptions impacts the resulting revenue requirements and customer bills over the time from today to 2050.

Before future costs can be calculated, the analyses must begin with the impact on current year depreciation expense and customer bills. Included in the calculation of current year impacts are the results of the analyses of depreciation approaches based on both high electrification and medium electrification – CEV set of business assumptions. For the high electrification scenario, which produces the most significant customer bill

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[4] https://www.nationalgrid.com/us/fossilfree

impacts, annual depreciation expense may need to be at least 50 percent higher than the National Grid companies' current, business as usual depreciation expense. These increases in depreciation expense translate to gas delivery bill impacts of approximately 8 percent or more, depending on the operating company. The results of both the high electrification and medium electrification – CEV units of production ("UoP") scenarios also show that proposals made by utilities in recent rate cases to address the impact of the CLCPA on depreciation are actually rather conservative initial steps to incorporate CLCPA impacts into depreciation rates based on the business assumptions associated with each scenario. The true impact over a longer term is likely to be higher, depending on the future state of the industry.

Figure 1a. Annual Gas Depreciation Scenarios as of December 2021 Based on CLCPA Assumptions (KEDLI)

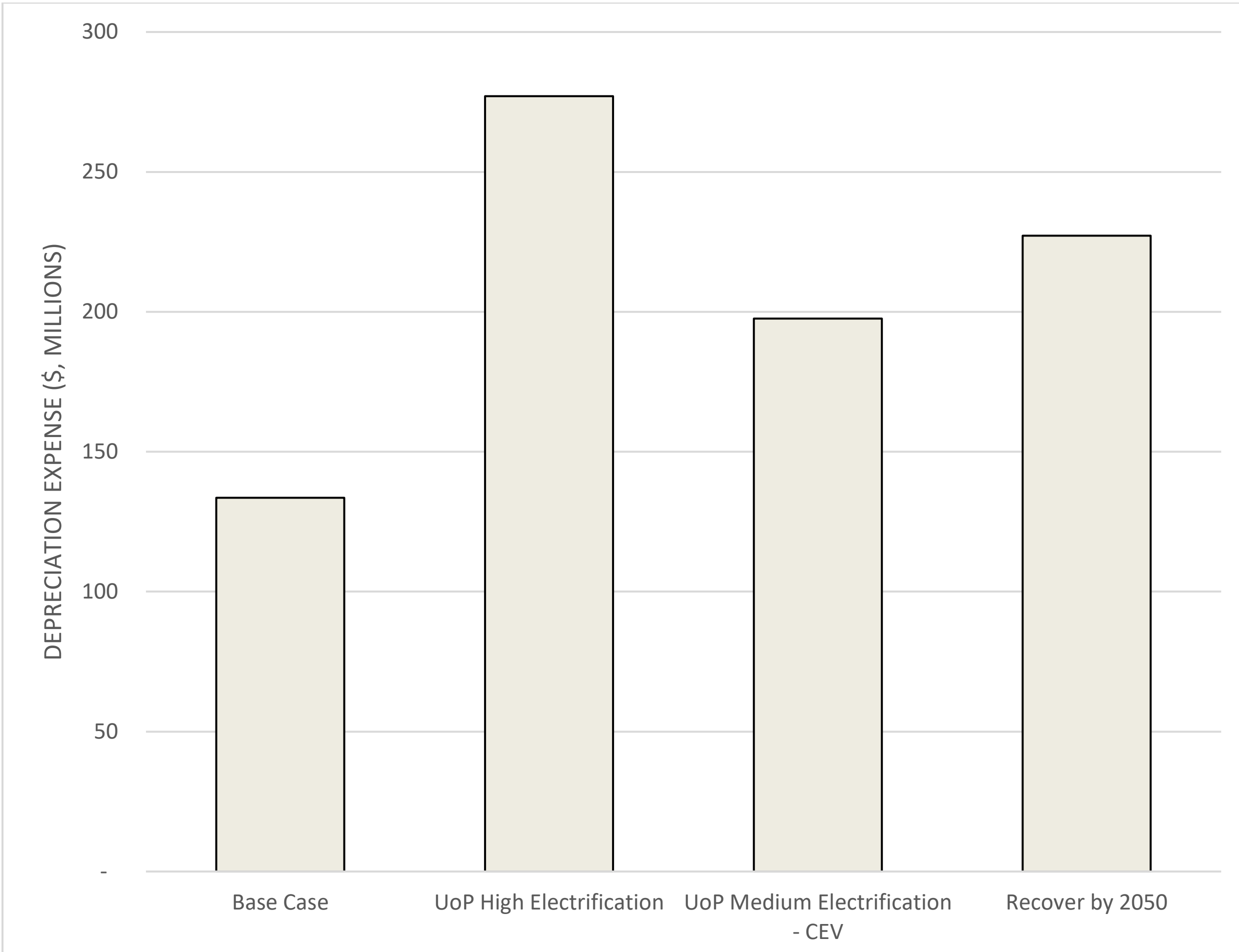


Figure 1b. Annual Gas Depreciation Scenarios as of December 2021 Based on CLCPA Assumptions (KEDNY)

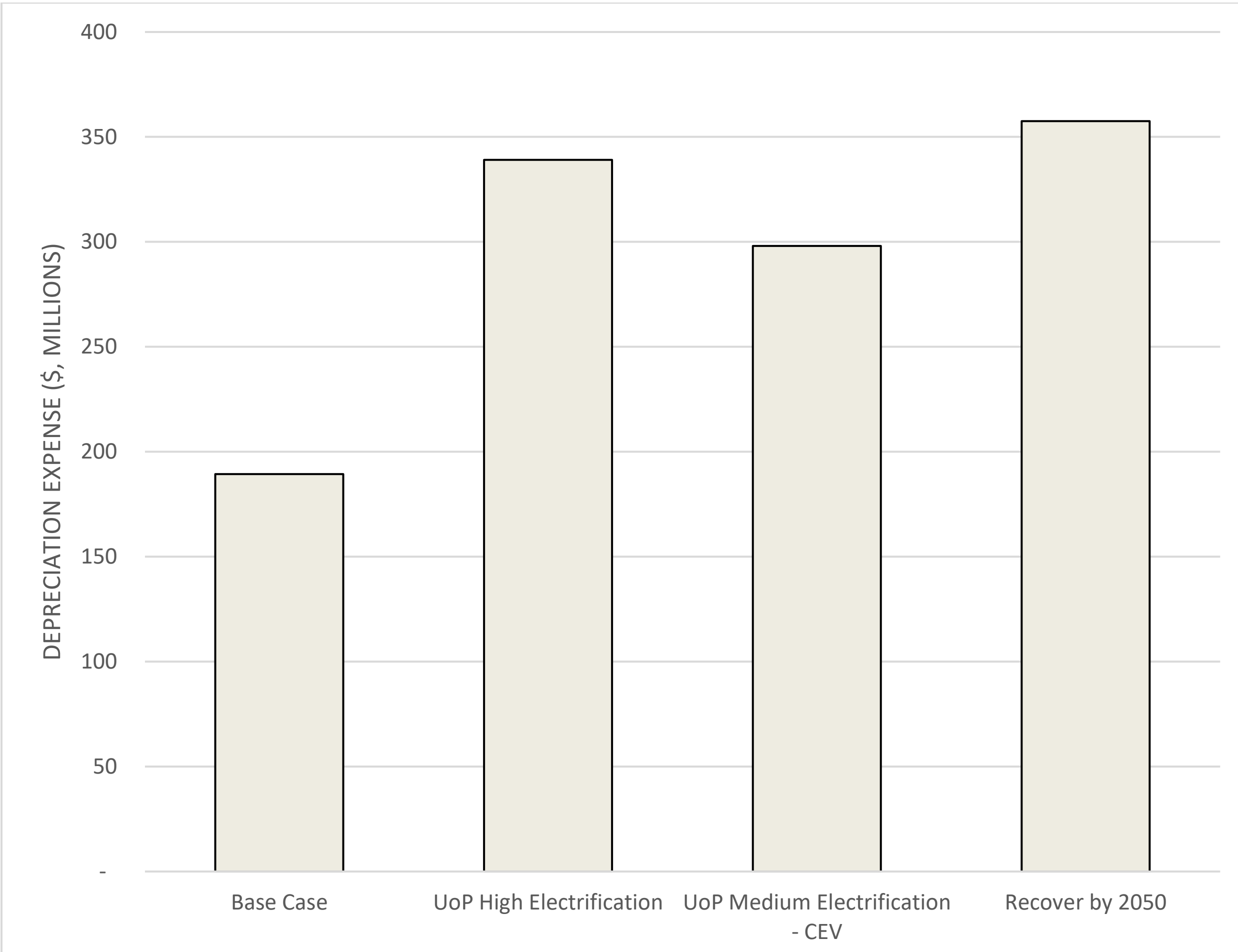
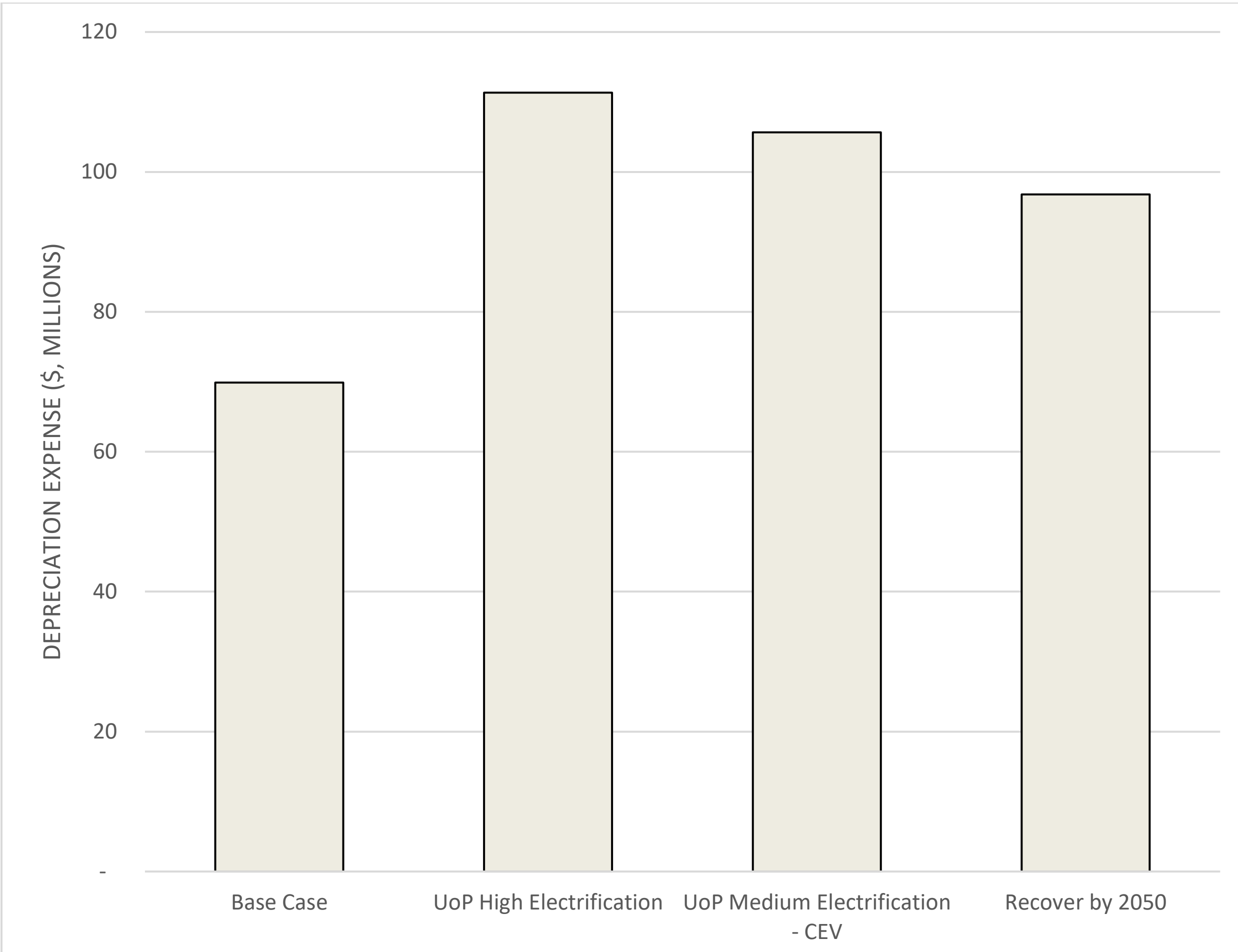


Figure 1c. Annual Gas Depreciation Scenarios as of December 2021 Based on CLCPA Assumptions (NMPC)



Figures 1a, 1b and 1c, above, provide the results, based on December 31, 2021 balances, of several scenarios for current year annual gas depreciation expense, which incorporate the estimated service lives, method of depreciation ,or assumptions about the future state of the industry that could result from the CLCPA.[5] The figures provide the current year annual depreciation expense resulting from depreciation rates based on

[5] The amounts shown in Figures 1a, 1b and 1c are for gas only and represent annual depreciation amounts calculated as of December 31, 2021. "UoP" stands for Units of Production. The specifics of each scenario are discussed in more detail in the Results section of this report.

business as usual conditions ("base case");[6] the result of using the units of production method based on the customer assumptions set forth in the Gas Planning Order ("UoP high electrification"); the result of using the units of production method based on a set of business assumptions consistent with National Grid's Clean Energy Vision ("UoP medium electrification – CEV "); and the result of recovering all remaining costs on a straight line basis by 2050. The UoP high electrification and recover all by 2050 scenarios are two of the three scenarios requested in the Gas Planning Order.[7] The results of the analyses shown above highlight that there is a wide range of outcomes depending on the assumptions used as inputs.

Importantly, the results shown in Figures 1a, 1b and 1c, above, only show the impact on current rates. Depreciation impacts not only today's rates but, due to the impact on both future depreciation expense and future rate base, depreciation established today has a significant impact on future rates, as well. Higher depreciation today means lower depreciation and rate base in the future, all else equal.

The analyses provided in this report estimate the impacts of these depreciation scenarios on future revenue requirements and customer bills. These analyses first require selection of a set of business assumptions, upon which depreciation scenarios can be modeled for each year through 2050. As a control comparison, a business as usual set of business assumptions was determined. As discussed in more detail in Part III of the report, the business as usual set of business assumptions provides a comparison

[6] Gannett Fleming is currently engaged to perform depreciation studies for KEDNY and KEDLI. The base case for these operating companies is based on preliminary results from these studies. For NMPC, the depreciation parameters are based on the most recent depreciation study.

[7] We note that while the Commission requested one additional scenario in which all new plant is recovered by 2050, this has no impact on the December 31, 2021 balances. Accordingly, this scenario is not shown here. However, it was analyzed for future years.

for the impacts of a specific business assumption scenario on future revenue requirements and bill impacts.

For scenarios analyzing the potential impacts of the CLCPA, the first set of business assumptions considered was high electrification scenario requested by the New York Commission. Figures 2a, 2b and 2c, below, show how these different depreciation approaches affect not only current rates, but also what happens to depreciation, revenue requirements and customer bills in the future based on certain assumptions about the business over the next three decades. The charts show the revenue requirement[8] on a per customer basis (used as a proxy for customer bill impacts) for each year from January 1, 2022, through December 31, 2050, that result from different depreciation scenarios if customer loss follows the high electrification set of business assumptions. The recover new by 2050, recover all by 2050 and UoP scenarios shown in Figures 2a, 2b and 2c set forth the results of the scenarios required by the Gas Planning Order.

[8] Due to the complexity of forecasting other revenue requirement components, such as operations and maintenance expense and taxes, the revenue requirement projections for National Grid only incorporate depreciation expense and the return on rate base. Future depreciation expense and rate base is based on forecasts of capital expenditures, gas throughput, and customer counts.

Figure 2a. Projected Revenue Requirement Per Customer
High Electrification – All Scenarios (KEDLI)

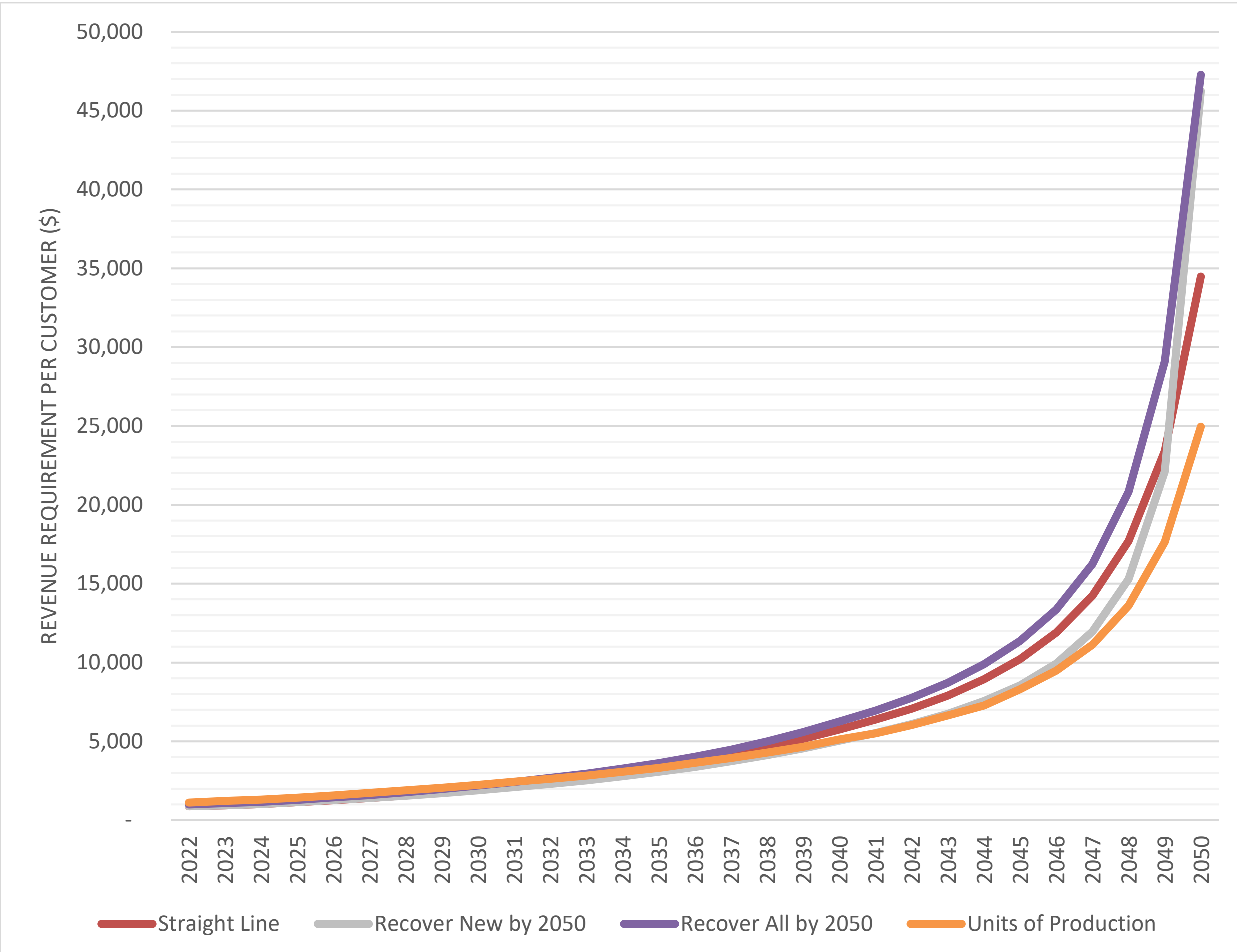


Figure 2b. Projected Revenue Requirement Per Customer
High Electrification – All Scenarios (KEDNY)

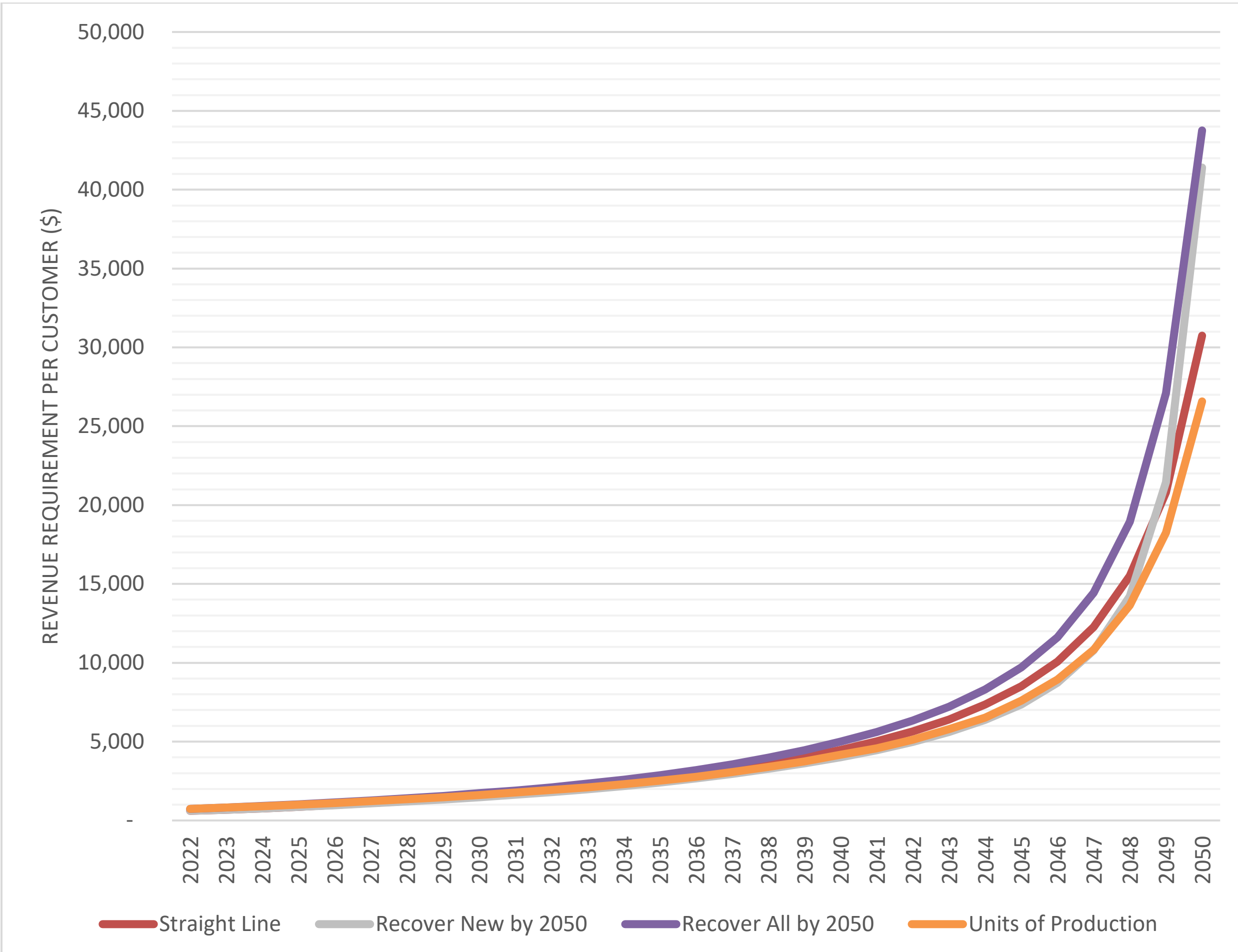
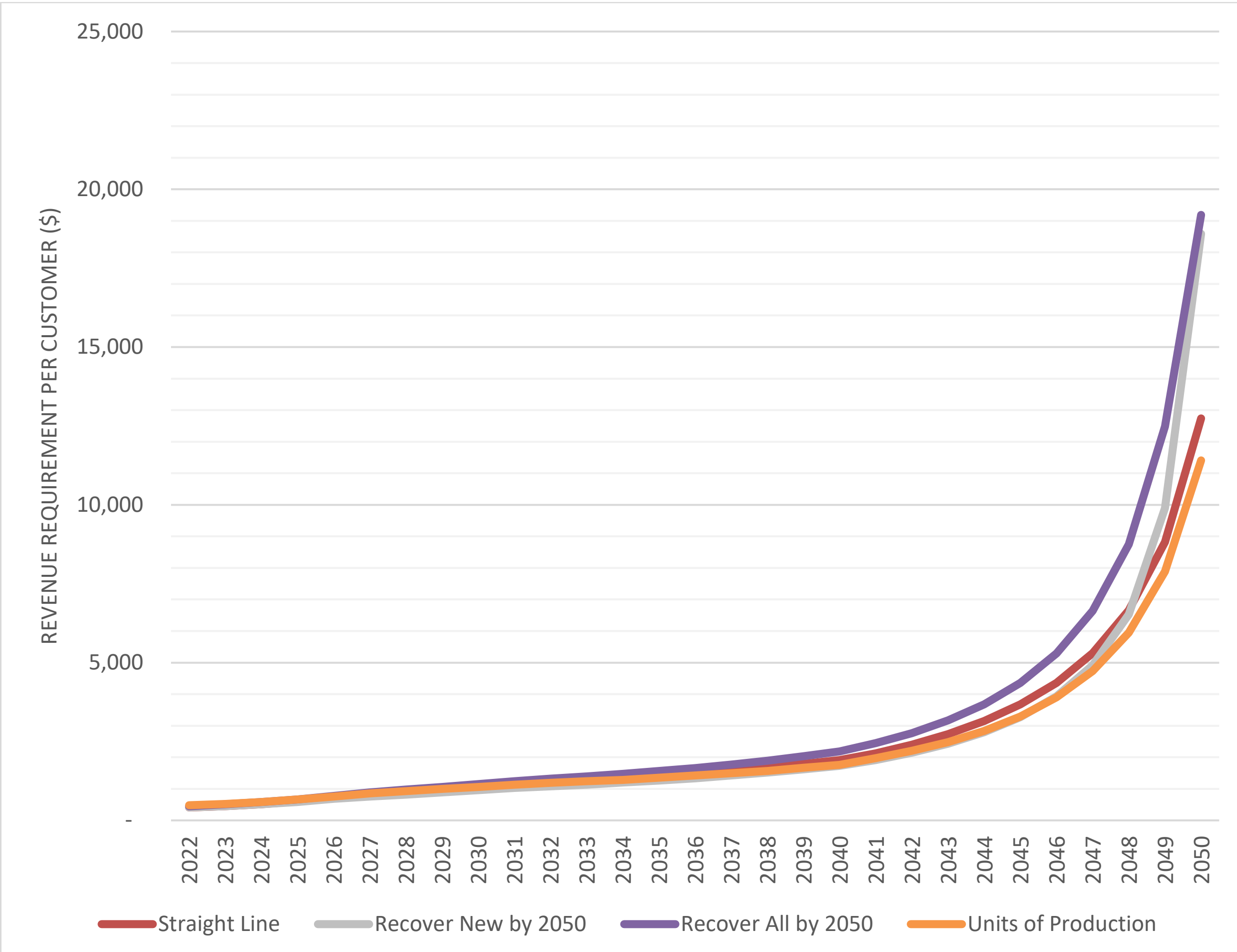


Figure 2c. Projected Revenue Requirement Per Customer
High Electrification – All Scenarios (NMPC)



While Figures 1a, 1b and 1c showed fairly significant differences between the different scenarios, with the units of production method having the highest depreciation (and bill impacts) and straight line depreciation the lowest, Figures 2a, 2b and 2c show that, over time, the opposite tends to be true. Further, as we get closer to 2050 the revenue requirement per customer increases at an exponential rate for most methods.[9] Additionally, the scenarios with the lowest depreciation expense in the near-term have the highest rate base remaining in 2050, meaning that these scenarios have a higher balance remaining to recover than the scenarios with higher depreciation in the near-term. Over the longer-term, for example, the straight line scenarios, which vary by operating company result in approximately 10 to 50 percent higher revenue requirements (*i.e.*, depreciation expense plus return on rate base) per customer.

Figures 2a, 2b and 2c also illustrate the impact that a specific set of business assumptions (in this case a 50% decline in customers by 2040 and a 90% decline by 2050, as set forth in the Gas Planning Order) can have on customer bills over time. For the high electrification set of business assumptions, customer bills increase significantly for each of the depreciation scenarios analyzed. While scenarios with higher initial depreciation expense result in lower bills over the long-run, the steep decline in customers for the high electrification business assumption scenario means that the cost per customer increases significantly as the analysis approaches the year 2050.

Importantly, different sets of business assumptions produce different results. For comparison, Figures 3a, 3b and 3c provide the straight line and the UoP depreciation scenarios but with the medium electrification - CEV set of business assumptions based on National Grid's Clean Energy Vision. These results incorporate more moderate declines in customers and throughput that are discussed in more detail in the Appendix of this report.

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[9] As is discussed in more detail in the Appendix to this report, a portion of the increase on a per-customer basis is due to the composition of the overall customer base at different points in time, including a shift under high electrification assumptions toward a greater proportion of commercial and industrial customers. However, analyses performed by customer class also produces similar conclusions to the analyses shown here.

Figure 3a. Projected Revenue Requirement Per Customer
Medium Electrification - CEV – Straight Line and UoP Scenarios (KEDLI)

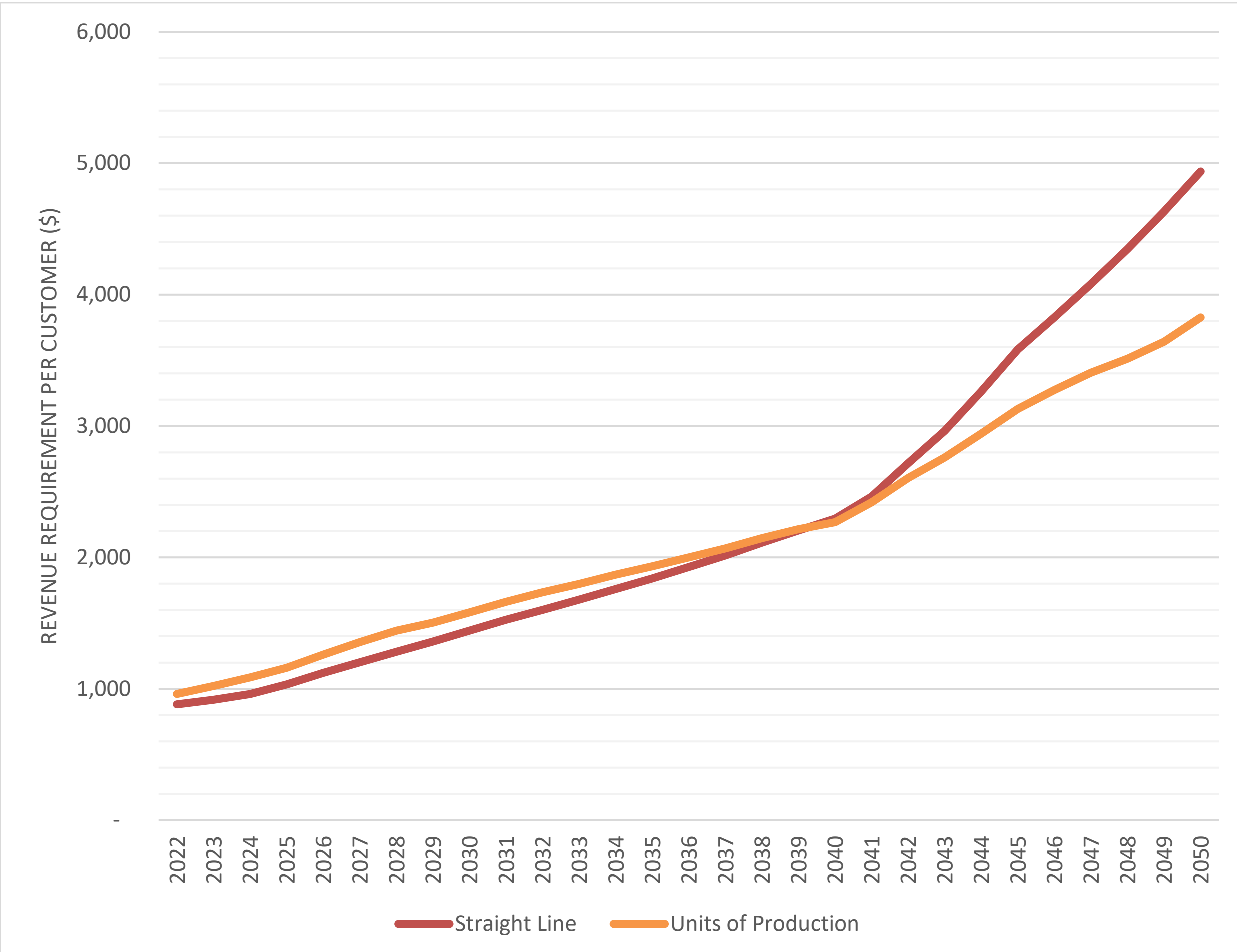


Figure 3b. Projected Revenue Requirement Per Customer
Medium Electrification - CEV – Straight Line and UoP Scenarios (KEDNY)

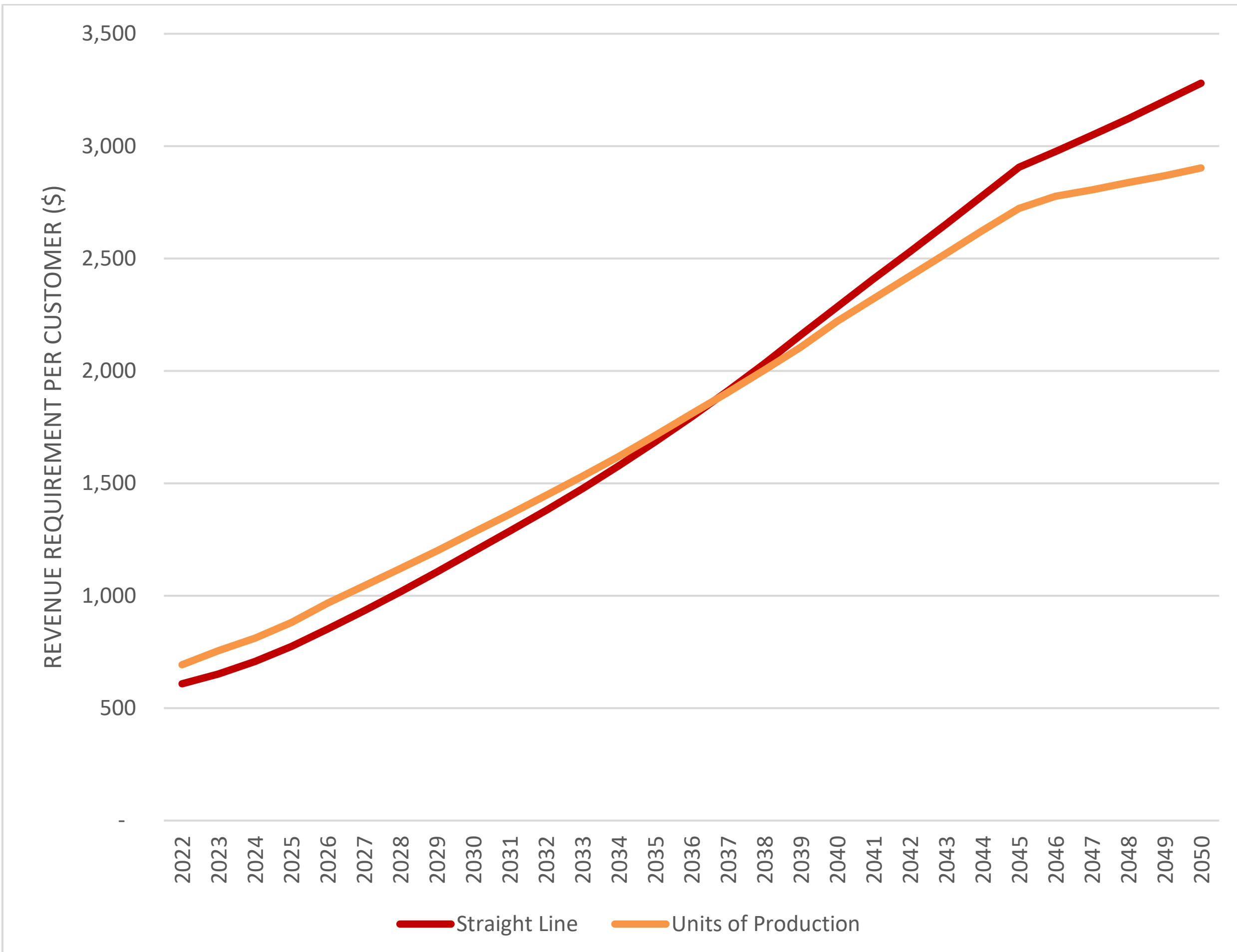
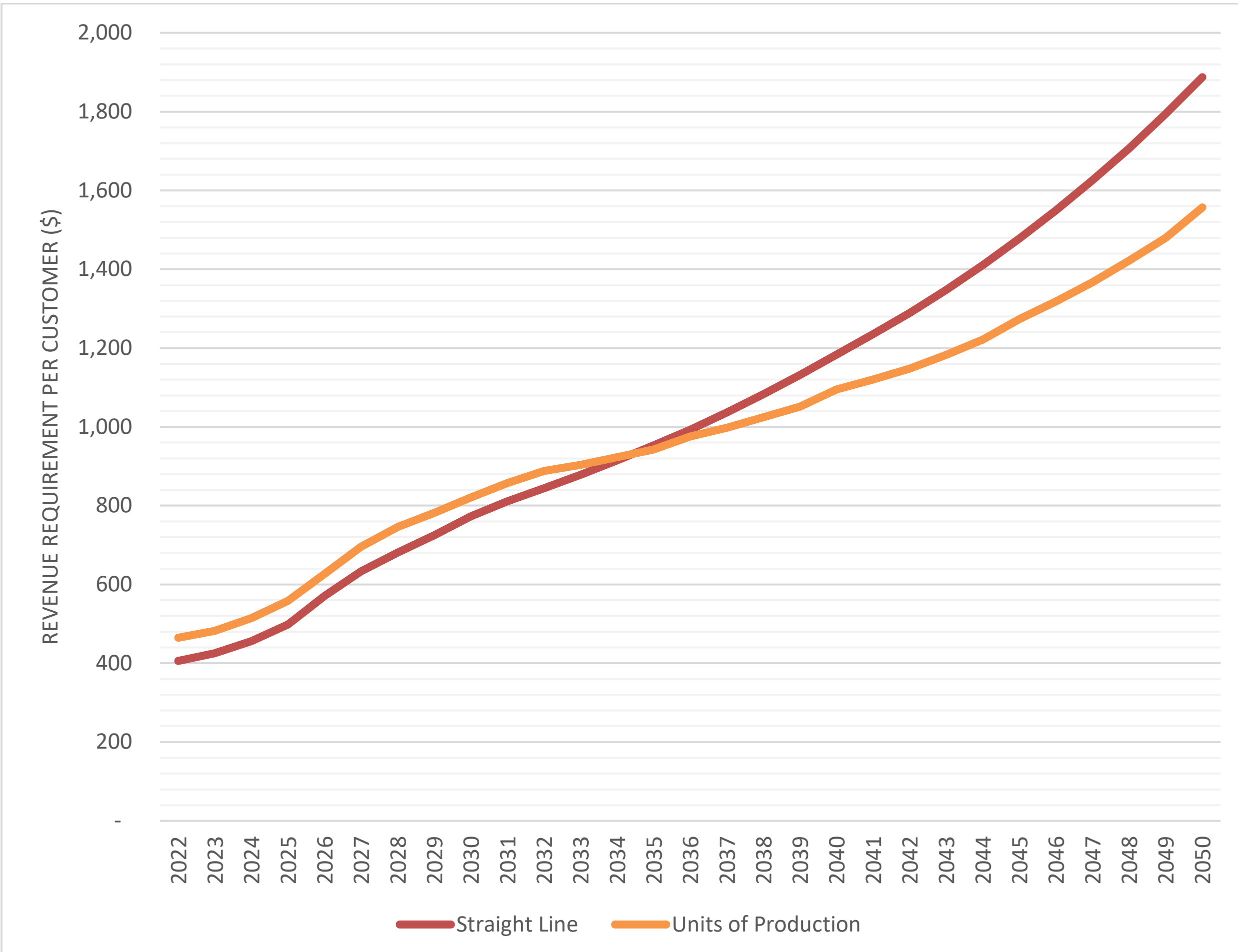


Figure 3c. Projected Revenue Requirement Per Customer
Medium Electrification - CEV – Straight Line and UoP Scenarios (NMPC)



As can be seen by comparing Figures 3a, 3b and 3c, above, with Figures 2a, 2b and 2c, the medium electrification – CEV set of business assumptions produces a lower revenue requirement per customer than the high electrification scenario for each depreciation approach. For both the straight line and UoP depreciation scenarios, the revenue requirements per customer for the high electrification set of business assumptions were approximately seven to nine times higher than for the medium electrification – CEV set of business assumptions. Thus, customer bill impacts in the future are likely to be at least as much a function of the future state of the gas industry (*i.e.*, the set of business assumptions) as the specific regulatory or depreciation approach used. Further, while revenue requirements per customer for the high electrification set of business assumptions increase materially under all depreciation scenarios, increases are more moderate for the medium electrification - CEV scenario. This is particularly true for depreciation approaches with higher depreciation today. For example, the units of production method for the medium electrification – CEV scenario produces customer bills over the full period through 2050 that are relatively close to projected bill impacts under a business as usual scenario (in which there is no impact from the CLCPA). In contrast, customer bills for the high electrification set of business assumptions are at least six times higher in 2050 when compared to the medium electrification – CEV set of business assumptions. A comparison of these results for each of the three sets of business assumptions is shown in Figures 4a, 4b and 4c below.

Figure 4a. Projected Revenue Requirement Per Customer
Business as Usual vs Units of Production (CEV and HE) (KEDLI)

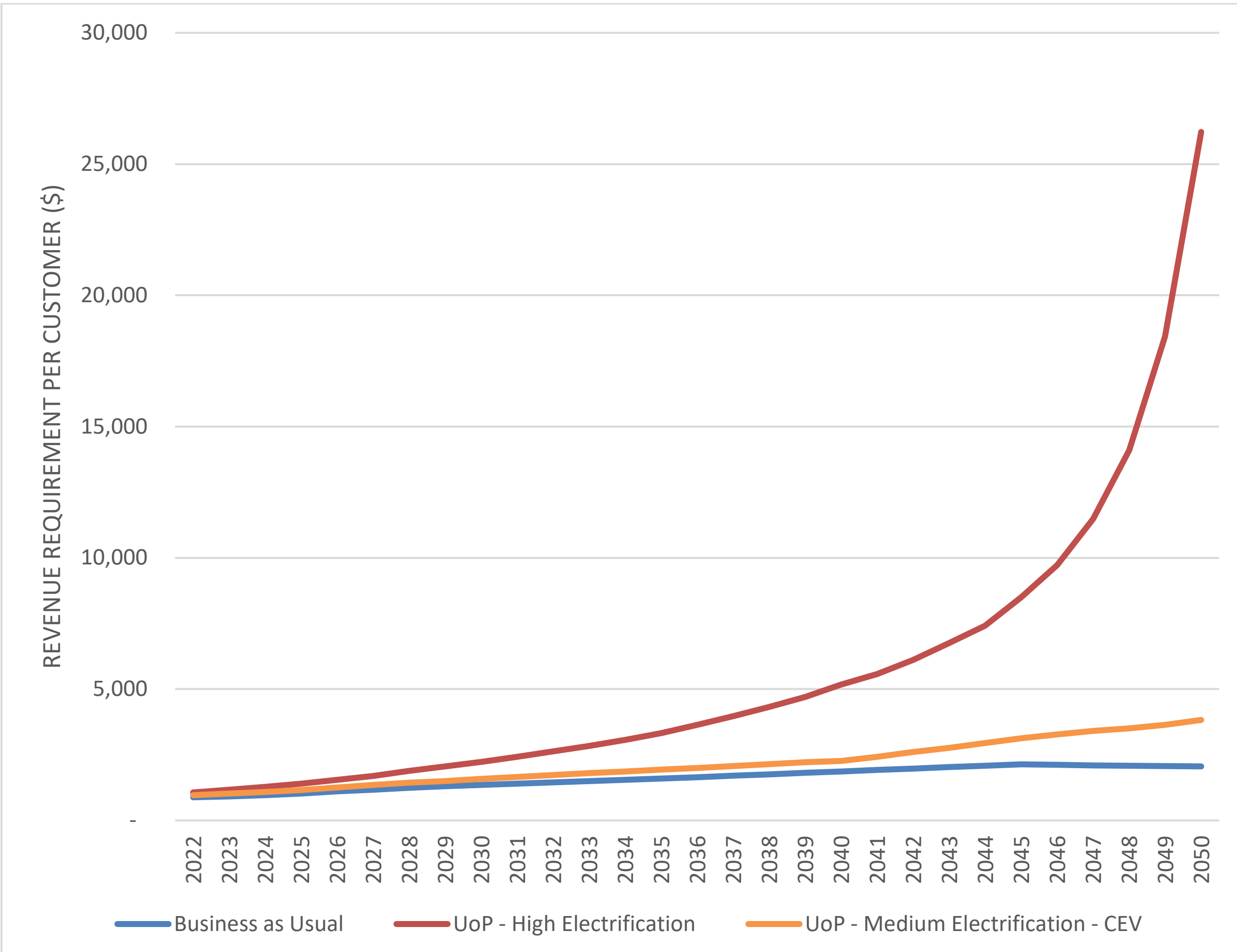


Figure 4b. Projected Revenue Requirement Per Customer
Business as Usual vs Units of Production (CEV and HE) (KEDNY)

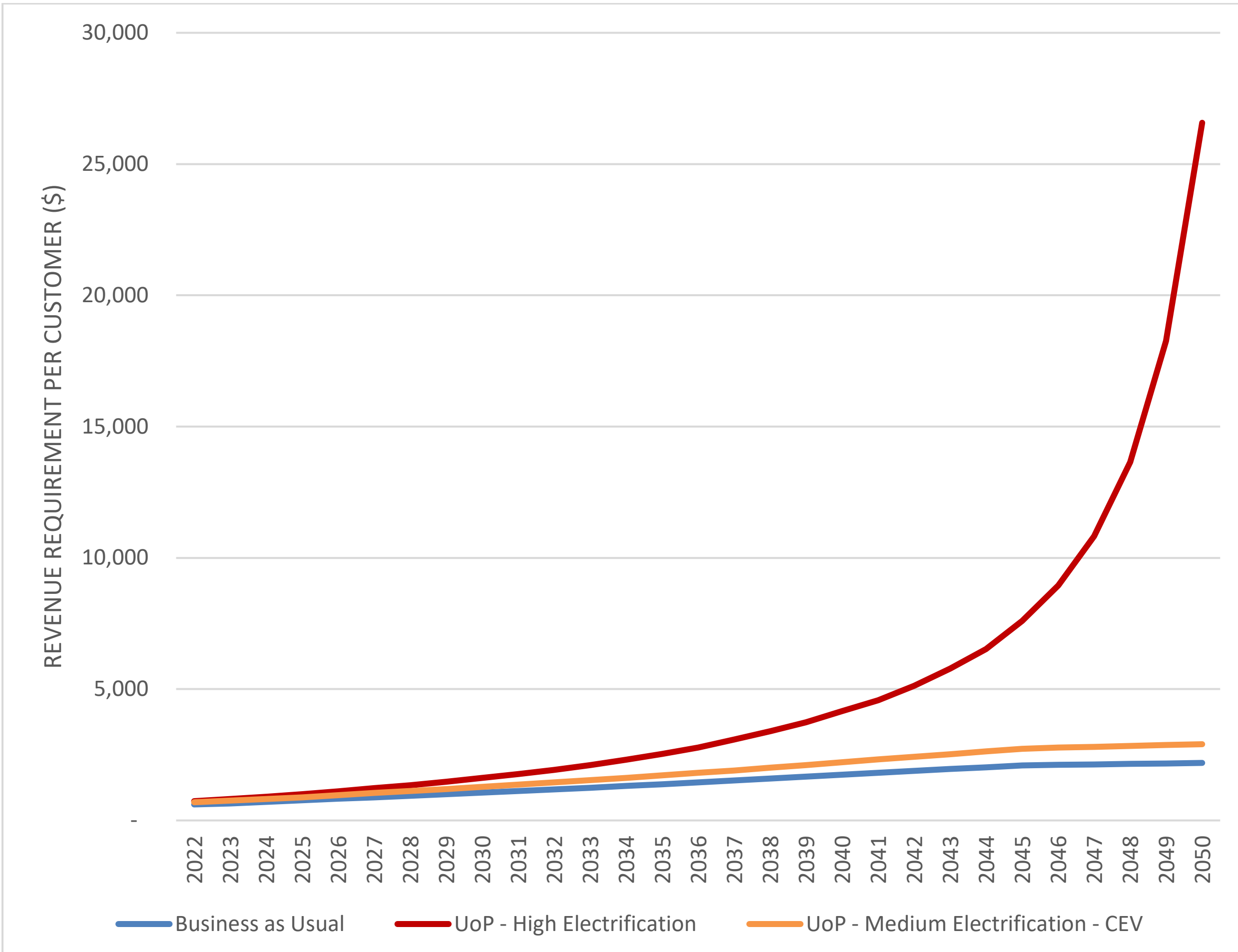
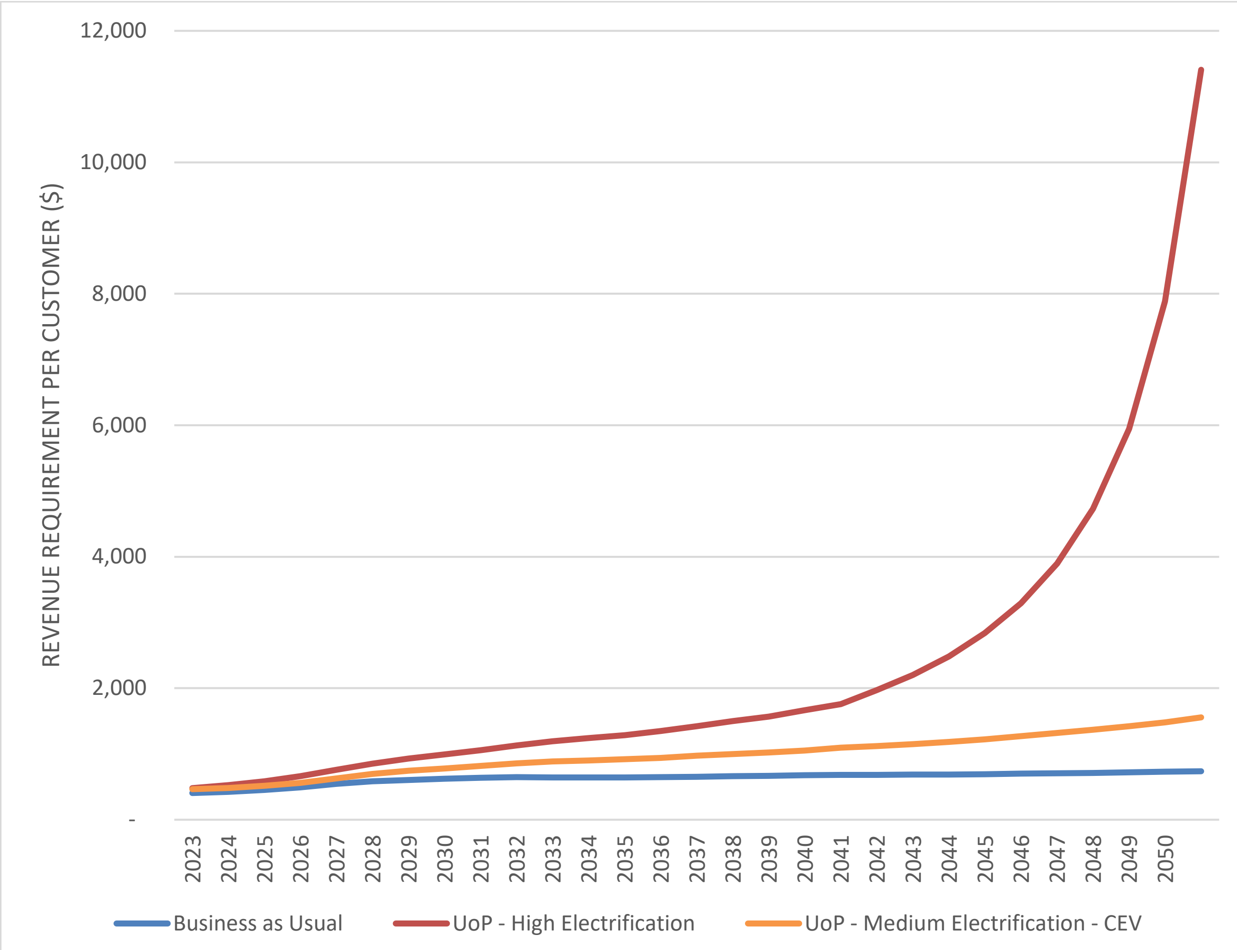


Figure 4c. Projected Revenue Requirement Per Customer Business as Usual vs Units of Production (CEV and HE) (NMPC)



The analyses set forth in this report support several conclusions related to depreciation concepts as well as the impacts of different business assumptions about the future state of the gas industry. First, the scenarios analyzed show that higher depreciation expense today results in lower revenue requirements and customer bills in the future, all things being equal. Depreciation scenarios, such as units of production, that result in higher depreciation expense in the near term to result in lower customer bill impacts in future years.

Second, the analyses show that if gas demand and the number of customers decline significantly, failing to increase depreciation today could produce significant intergenerational inequity issues and result in future customers who remain on the system bearing a significantly higher share of the costs of the gas assets. Finally, the analyses set forth in this report show that more moderate declines in gas throughput and the number of customers produce more moderate bill impacts than occur under a higher electrification scenario. National Grid's medium electrification – CEV scenario produces lower overall customer gas bills than a high electrification scenario, which generally holds true for different depreciation approaches. The revenue requirement per customer in 2050 is at least six times lower for the medium electrification – CEV set of business assumptions than the high electrification scenario, depending on the operating company and depreciation scenario analyzed. These results and conclusions should help inform decision-making as utilities and the New York Commission assess the most reasonable pathway forward for the gas industry and recognize both the short- and long-term impacts of different depreciation approaches.

PART I. BACKGROUND

NATIONAL GRID

DEPRECIATION STUDY ON CLIMATE CHANGE POLICIES

PART I. BACKGROUND

NEW YORK STATE LAWS AND REGULATORY PROCEEDINGS

New York State is a leader in action on climate change and the CLCPA is one of the most significant climate policy laws in the country. The CLCPA requires greenhouse gas emissions reductions from all sectors of the economy by 40 percent by 2030 and 85 percent by 2050 (both percentages are based on 1990 emissions levels). Other states, such as Massachusetts and California, have enacted similar laws and their regulatory commissions face a similar set of issues. The CLCPA, and the greenhouse gas emissions reductions it mandates, will have a transformative impact on many industries in the state. Achieving an 85 percent reduction in carbon emissions will significantly change the way businesses and consumers use energy, which in turn will have significant impacts on utilities in the state.

The CLCPA is a wide-reaching law that will impact all areas of the state's economy and the environment. The law codifies several objectives to address climate change, including the following:

- 40% economy-wide reduction in greenhouse gas emissions by 2030
- 85% economy-wide reduction in greenhouse gas emissions by 2050
- 100% zero-emission electricity by 2050
- 70% renewable energy by 2030
- 9,000 MW of offshore wind by 2035
- 6,000 MW of solar generation by 2025

- 185 trillion Btu of end-use energy savings[10]

Among the industries likely to be affected by the CLCPA is the gas industry. The precise pathways to achieving 85 percent reductions in carbon emissions over the next three decades are uncertain and there is a range of possibilities. However, policies designed to achieve significant reductions in emissions of these greenhouse gases may drive changes to the gas system and a significant reduction in the amount of natural gas used. Alternative fuels such as renewable natural gas and hydrogen could displace the use of fossil gas in the existing gas infrastructure, but these fuels are not yet available at scale. Additionally, there are open questions as to whether electrification can safely and reliably provide all of the state's heating needs, particularly in colder regions and harder to electrify locations. The gas infrastructure in the state, which has provided energy to the state of New York for close to two centuries, remains a valuable asset and an effective, reliable and efficient way of delivering fuel for heat and other uses, such as industrial uses. It is, therefore, likely that these gas systems will remain, though perhaps at a smaller scale with fewer customers and smaller volumes of gas.

In 2020, the New York Commission initiated a general proceeding on natural gas planning[11] ("Gas Planning Proceeding") and electric transmission planning.[12] The scope of Gas Planning Proceeding is not limited to the impacts of the CLCPA, as it addresses gas planning issues more broadly.

On May 12, 2022, the New York Commission issued the Gas Planning Order, stating that:

> We recognize that failure to fully depreciate assets in a timely fashion while LDCs still have robust customer bases may lead to stranded costs. The Commission thus agrees with those commenters calling for a study that

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[10] New York State Climate Action Council Draft Scoping Plan, December 30, 2021, p. 17.
[11] Case No. 20-G-0131.
[12] Case No. 20-E-0197.

> examines both the structure of accelerated depreciation and its potential impacts on ratepayers. The Commission thus directs the LDCs to file depreciation studies with the following scenarios: (1) a scenario that fully depreciates all new gas plant installed beginning in 2022 by 2050; (2) a scenario that fully depreciates all gas plant by 2050; and (3) a scenario that assumes 50 percent of gas customers exit the gas system by 2040 and that 10 percent of gas customers remain after 2050. For each scenario, the LDCs shall include the revenue requirement impact and approximate bill impacts for residential and commercial customers.[13]

This report sets forth the results of the depreciation study that analyzes and assess these scenarios. As will be discussed in more detail, the results include depreciation expense, revenue requirement and customer bill impacts for current ratepayers, as well as projected impacts for each year through 2050. These provide both short- and long-term impacts of different depreciation approaches and, as discussed within this report, different scenarios produce different results in both today and further into the future.

However, before presenting the results, it is first important to explain relevant depreciation and ratemaking concepts. The sections that follow provide an overview of these, which are addressed in more detail in Part III of this report. These concepts will help with understanding and interpreting the results of our analyses, including the different depreciation approaches analyzed in the context of the New York Commission's Gas Planning Order.

SUMMARY OF DEPRECIATION CONCEPTS

Definition of Depreciation

An assessment of reasonable approaches for addressing the impact of climate change policies on depreciation (and, therefore, reasonable utility rates) must first start with an understanding of depreciation and how it impacts utilities, customers, and investors. An overview of several depreciation and ratemaking concepts is presented in

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[13] Case No. 20-G-0131, Order Adopting System Planning Process, pp. 61-62.

this section and these are discussed in more detail in Part III of this report. Once depreciation practices are determined, their impacts on a company's operations and the ratemaking process can be identified and understood.

There are several prominent definitions of depreciation used in both accounting and regulatory contexts. For example, the Federal Energy Regulatory Commission's ("FERC") gas Uniform System of Accounts, which the New York Commission has adopted, defines depreciation as:

> *Depreciation*, as applied to depreciable gas plant, means the loss in service value not restored by current maintenance, incurred in connection with the consumption or prospective retirement of gas plant in the course of service from causes which are known to be in current operation and against which the utility is not protected by insurance. Among the causes to be given consideration are wear and tear, decay, action of the elements, inadequacy, obsolescence, changes in the art, changes in demand and requirements of public authorities, and, in the case of natural gas companies, the exhaustion of natural resources. [14]

Additional definitions of depreciation are presented in Part III of this report. Each incorporates similar important elements to those incorporated into the Uniform System of Accounts definition above. Depreciation is a process of allocating capital costs to accounting periods. One purpose of this process of allocation is to match expenses to revenues for an enterprise. Given the importance of financial statements to investors, it follows that depreciation necessarily must be systematic and rational rather than arbitrary. There are additional important considerations for regulated entities, specifically natural monopolies subject to price regulation. Depreciation for regulated utilities is not merely an expense recorded to the income statement. Depreciation is also a direct component of the revenue requirement and impacts utility revenues as well. Additionally, it affects the rate base on which a utility earns a return as, more precisely, accumulated

[14] 18 C.F.R § 201, Definition 12B. The electric definition is similar, although does not include the clause related to exhaustion of natural resources.

depreciation is a reduction to the rate base. From a regulatory standpoint, depreciation is understood to be the return of investor capital and, as a result, appropriate levels of depreciation are necessary to attract the capital needed to provide safe, reliable, and affordable utility service.

Depreciation and Rate Base

For capital provided by investors to fund utility operations, a fair return to investors is understood to have two key components: (1) the return on capital; and (2) the return of capital (the latter of which may also be referred to as the recovery of capital). Both are related and of importance to investors. The return on capital compensates investors for the risk of their investment. The determination of a fair return on capital is generally guided by the *Hope* and *Bluefield* standards established by the U.S. Supreme Court, which generally posit that the return on investor capital should be commensurate with returns for other investments of similar risk.[15] Depreciation, which is the return of capital, is instead related to the preservation of investors' original investment, meaning returning the original amount invested in the enterprise. Based on current regulatory practices, there is a general expectation that if an investment is prudent at the time it is made, and if that investment becomes part of a company's rate base, then revenues will be established to allow the original investment to be returned to the investor and, in addition, to provide the investor an opportunity for a return on that investment that is commensurate to the returns for other investments with similar risk.

Estimating Depreciation

There are multiple aspects of depreciation that are estimated and determined in a depreciation study. Each has an impact on the resultant depreciation rates and accruals.

[15] *Bluefield Water Works Co. v Public Service Commission*, p. 262 U.S. 693.

The first is the service life estimates for an asset or group of property. As will be discussed in more detail in Part III of this report, the service life is defined as the time between the date an asset is placed in service and when the asset is retired from service. Importantly, the cause of retirement at the end of an asset's life does not have to result from any specific factor. Factors to be considered include not only wear and tear and other physical factors, but also more external factors such as obsolescence and the requirement of public authorities.

The second aspect is the net salvage estimates for an asset or a group of property. Net salvage is defined as gross salvage (*i.e.*, money received upon the retirement of an asset, such as for scrap) less cost of removal (*i.e.*, the cost incurred to retire an asset). For most utility assets cost of removal exceeds gross salvage and, therefore, net salvage is typically a negative amount. In order to allocate the full cost of an asset (*i.e.*, original cost less net salvage) over its service life, depreciation includes estimates of future net salvage.

The third aspect is the depreciation model or depreciation system used to calculate depreciation. The depreciation model is defined by a depreciation method, procedure and technique. Depreciation methods are discussed in more detail in Part III of this report. The straight line method, which allocates costs in equal amounts for each year of an asset's service life, is the most common method used in the utility industry. However, there are also accelerated and deferred methods. For accelerated methods, depreciation is higher in the early years of an asset's life and lower in the later years when compared to the straight line method. For deferred methods, the opposite is true and depreciation is lower in the early years and higher in the later years when compared to the straight line method.

In addition to these methods, the units of production method allocates costs equally to each unit of production (or consumption) rather than in equal amounts each year. If, for example, the utilization of an asset were to decline by 50 percent over its service life, then depreciation would be twice as high in the early years as in the later years. More precisely, annual depreciation would decline in proportion to the decline in utilization over the service life. In instances in which production or consumption is expected to either increase or decrease over the service life of an asset, the units of production method may provide a better match of expenses and revenues than the straight line method.

The CLCPA's Impact on Depreciation

The concepts discussed above (and in more detail in Part III) related to depreciation and service lives are a critical component of the ratemaking process. However, they are even more critical in a situation such as the one currently facing the New York Commission in that the combined impact of technology change and state laws to address climate change will result in a profound transformation of energy systems in the state and the utilities the New York Commission regulates. The precise path forward abounds with uncertainty. Nevertheless, the dynamics of these issues mean that determining just and reasonable depreciation rates has a more pronounced importance than in a business as usual regulatory proceeding. Not only do these forces of change mean there is a distinct probability that many assets will experience different service lives than has historically been the case, but there is also a possibility, depending on regulatory and policy outcomes, that gas demand could decline in the coming decades and that a significant portion of a utility's customer base could change energy sources, either ceasing to be gas customers or significantly reducing their consumption. This means that the margin of error is much smaller – if depreciation is too low, there could be a future in which the revenue requirements necessary to provide a return of and return on capital costs exceed the capacity of remaining customers to pay.

With these concepts in mind, there are three main aspects of depreciation that could be impacted by significant changes in gas consumption. The first is the useful lives of each Companies' assets. Gas assets may have shorter service lives than has been the case historically. For example, if a customer decides to fully electrify their energy usage, some or all of the infrastructure providing natural gas service to that customer may be retired. With widespread electrification, this could result in shorter service lives for assets such as gas services, meters, and meter installations. Gas mains and regulator stations could also be affected if natural gas throughput declines, as many of these facilities could become obsolete. Other assets may also become obsolete if they are no longer needed due to declines in natural gas throughput.

The second aspect that could be affected is cost of removal. Under normal utility operations, cost of removal often occurs for replacement projects. However, it is possible these costs could be different in the future if, for example, portions of the natural gas system are electrified as a whole and specific assets have to be removed from the ground, rather than be abandoned in place.

Lastly, the depreciation method used to allocate capital costs may need to be reconsidered. Traditionally, almost all utilities have used the straight line method of depreciation in which capital costs are allocated equally over the service lives of the assets – depreciation is calculated so that equal amounts are recorded in each year of an asset's estimated service life. Straight line depreciation works well when utilities have relatively stable demand, as the annual depreciation accruals tend to approximate the consumption on the system. However, if consumption were to decline significantly, a question arises whether it is equitable to have equal depreciation charges today as in the future when there is less consumption. As will be discussed in more detail in Parts II and III of this report, there are methods that can be used to align depreciation with gas consumption which could provide a better match of depreciation expense with revenues and provide a more equitable allocation of costs if there is a significant decrease in demand over the next 30 years. An advantage of this approach is that it is in some ways agnostic to the precise future state of the industry. If, for example, gas consumption declines by 50 percent over the next 30 years, then depreciation would match this decline regardless of whether it was the result of a commensurate loss in customers, a decline in consumption on a per customer basis, or some combination of the two. However, the UoP method requires a long-term estimate of gas demand, which can present a challenge to using this method.

This report presents the projected impacts of different depreciation approaches on depreciation expense, revenue requirements, and estimated customer bills under different operating environments (modeled using the number of customers and annual gas throughput in each year). While net salvage is included in the analysis, the primary approaches considered are focused on different methods of depreciation and approaches to the service lives used for the depreciation calculations. The analysis performed for this study provides an assessment of both short- and long-term impacts of each of these methods and approaches. Because depreciation decisions today have a significant impact on future revenue requirements and customer bills, these analyses should help inform policymakers and decision makers in assessing potential ways to address the impacts on the natural gas industry of the CLCPA.

PART II. RESULTS OF STUDY

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INTRODUCTION

The depreciation scenarios requested in the Gas Planning Order incorporate three primary inputs that significantly affect the results. Each of these inputs should be considered when analyzing the impacts of different depreciation and ratemaking approaches. The first, referred to as **business assumptions**, is the set of assumptions about the future state of the gas business. In the assessment of these scenarios, the future state of the business is guided by assumptions about two parameters: 1) the number of customers over time; and 2) the consumption of the service (*i.e.,* gas delivery) over time, as measured by gas throughput. Other assumptions, such as capital spending, are in part functions of the decline in customers or service over time.

The second input, referred to as **depreciation scenarios**, describes the depreciation approach used in conjunction with a given set of business assumptions. The depreciation scenarios analyzed include continuing to use straight line depreciation; recovering all new plant installed after 2021 by 2050, while using straight line depreciation for existing plant; recovering all plant by 2050; and using the units of production method to align depreciation with the decline in throughput. Each depreciation scenario produces different results, and the results differ significantly depending on the assumption about the future state of the business.

The final input to consider is time. Depreciation scenarios have different impacts on the revenue requirement and customer bills over time, and these impacts vary depending on business assumptions. However, there are certain concepts that tend to hold true across all scenarios. The first is related to the trade-off between current and future customers. Several of the depreciation scenarios result in significantly higher depreciation today. However, higher depreciation today reduces rate base at a faster rate and, over time, these scenarios produce lower revenue requirements and lower customer bills than scenarios in which depreciation is initially lower.[16] The second is that business assumptions that incorporate steep declines in customers produce significant, and accelerating, bill impacts on remaining customers. In scenarios with more extreme declines in consumption, even the higher depreciation scenarios struggle to keep up with the decline in customers.

Description of Scenarios

The scenarios modeled in our analysis incorporate both business assumptions and depreciation scenarios. The results of each have been calculated in detail based on current balances and have also been modeled for future periods, specifically for each year through 2050. Due to the complexity in forecasting the future over the next three decades, certain simplifying assumptions were made for the modeling of future depreciation expense, revenue requirements and bill impacts. These will be discussed further below. However, first we discuss the business assumptions and depreciation scenarios considered.

The business assumption scenarios modeled are as follows:

- **Business as Usual.** The business as usual scenario assumes no decline in gas throughput or customers. It is effectively a control output that shows the results of our modeling for conditions that would persist if the CLCPA did not exist and the gas business would carry on as if nothing changed.
- **High Electrification.** This business assumption scenario is based on the New York Commission's order in the Gas Planning Order in which the number of customers declines by 50 percent by 2040 and then to 10 percent of customers remaining by 2050. National Grid has provided detailed forecasts of customer counts and gas throughput for this scenario.

[16] As noted previously in Part I, this is a well understood concept and discussed in depreciation and regulatory literature, such as by NARUC.

- **Medium Electrification - CEV.** This business assumption scenario models a more moderate reduction in both customers and throughput and is based on National Grid's Clean Energy Vision. In this scenario, much of the gas system continues to be used with alternative fuels such as renewable natural gas ("RNG") or hydrogen, but at lower overall volumes. The company provided customer decline and gas throughput amounts that were used for this scenario, which are discussed in more detail in the Appendix of this report.

For each of the business assumption scenarios described above, the following depreciation scenarios were modeled:[17]

- **Straight Line, No Adjustments to Service Lives.** This scenario (also referred to simply as "straight line" in this report) effectively assumes depreciation continues as it would in a business-as-usual scenario. No adjustments are made to the service lives or method of depreciation. Because New York uses the whole life method, the portion of theoretical reserve imbalance above 10 percent of the theoretical reserve is amortized over 20 years.
- **Recover New by 2050.** For existing assets installed in 2021 and prior, depreciation is calculated the same as in the straight line, no adjustments scenario. For assets added in 2022 and subsequent, all costs are recovered on a straight line basis by 2050.
- **Recover All by 2050.** All capital costs are recovered on a straight line basis by 2050.
- **Units of Production.** The units of production method is used, while service lives continue consistent with the straight line, no adjustments scenario. Annual gas throughput consistent with the specific business assumption scenario is used as the input to the units of production method.

[17] The one exception is the business-as-usual scenario for which only straight line depreciation was modeled, because under those operating conditions there would not be a need to adjust the approach to depreciation.

These business assumption and depreciation scenarios combine to produce 7 specific scenarios for which depreciation expense, the overall revenue requirement and estimated bill impacts were modeled for the years January 1, 2022 through December 31, 2050. These scenarios are shown in the matrix below:

Table 1. Business Assumptions and Depreciation Scenarios[18]

	Straight Line	Recover New by 2050	Recover All by 2050	UoP
Business as Usual	x			
High Electrification	x	x	x	x
Medium Electrification - CEV	x			x

As discussed above, to assess the impacts of different depreciation approaches over time, each of these scenarios was modeled for each year through 2050. Each of the values requested by the New York Commission -- depreciation expense, revenue requirements and bill impacts -- was calculated for each year in the study period (*i.e.,* January 1, 2022 through December 31, 2050). Due to the complexity of forecasting other revenue requirement components (such as O&M expenses and taxes), the revenue requirement projections in this report for National Grid are based on depreciation expense and the return on rate base. The depreciation expense results from the specific depreciation scenario and was calculated consistent with the depreciation scenarios described above. The revenue requirement is calculated based on projections of depreciation expense, rate base and the rate of return, that are discussed in more detail in the next section. Additionally, due to challenges associated with forecasting all of the components of customer bills over the next three decades, detailed bill impacts were not

[18] The orange highlighted cells in Table 1 represent the three scenarios specifically required by the Gas Planning Order.

modeled for future years. Instead, the revenue requirement per customer (*i.e.,* the total revenue requirement divided by the total number of customers) was calculated as a proxy for customer bill impacts.

FORECASTING FUTURE COSTS

Model Assumptions

The process of projecting long-term depreciation, revenue requirement, and bill impacts involves several assumptions about future operations. Assumptions incorporated into the modeling for this study are as follows:

- **Service Lives.** Service lives used are based on the survivor curves recommended in the most recent depreciation study.[19]
- **Retirements.** Retirements are a function of normal conditions (*e.g.,* retirement due to wear and tear, capacity upgrades, etc.) and customer loss. As customers leave the system, retirements increase to reflect a reduced asset base.
- **Net Salvage.** Net salvage is based on net salvage typically experienced for gas distribution assets.
- **Rate Base.** Rate base in 2021 is aligned with the current plant and accumulated depreciation balances.
- **Rate of Return.** The rate of return is aligned with National Grid's currently authorized rate of return from each operating company's most recent rate case.
- **Capital Expenditures.** Capital expenditures are based on National Grid's projection for each business assumption. These projections are presented and discussed in more detail in the appendix to this report.
- **Customer Counts.** Customer counts are based on National Grid's projection for each business assumption. These projections are presented and discussed in more detail in the appendix to this report.
- **Gas Throughput.** Gas throughput is based on National Grid's projection for each business assumption. These projections are presented and discussed in more detail in the appendix to this report.

[19] For KEDNY and KEDLI, Gannett Fleming is currently engaged to perform a depreciation study. The service lives and net salvage estimates used in this report are based on preliminary results from these studies.

Forecasting Considerations

There are several challenges that arise when forecasting the various factors that will impact future revenue requirements and customer bills. These challenges result both from the necessary simplifying assumptions needed to model these costs and because of uncertainty with factors such as capital requirements, useful lives, financial conditions (including costs of capital), customer counts and gas throughput. Further, many of these factors impact one another. Not only could the number of customers impact total customer bills, but customer bills could impact the number of customers (because higher bills could make gas heating less economical for customers when compared to other energy sources).

These challenges are even more pronounced in the more extreme scenarios modeled. Significant declines in customer counts, such as in the high electrification scenario, result in challenges modeling any depreciation scenario. Further, in scenarios with the most significant bill increases, there would be significant affordability issues for customers and financial challenges for utilities that will arise closer to 2050. There is, therefore, even more uncertainty in these scenarios, particularly because other policy actions would potentially be necessary to allow for both affordable energy and the financial health of the utility.

Given these challenges, the results set forth in this report should not be interpreted as forecasts with a high degree of certainty for specific costs over the next three decades. Instead, they should be interpreted as providing reasonable order of magnitude impacts of different scenario assumptions. That said, there is much more certainty in the overall directional impacts, particularly because these align with well-understood ratemaking and business concepts. Most notable is that higher depreciation today will, all else equal, result in lower customer bills in the future and that the sharper the decline in throughput and customers, the more pronounced the affordability and financial challenges that arise.

RESULTS

Current Year Results

Before presenting the results of each scenario for future years (*i.e.,* 2022 through 2050), we begin with current impacts. The graph shown below in Figures 5a, 5b and 5c includes the depreciation expense resulting from calculations as of December 31, 2021, under different depreciation scenarios and methods.

Figure 5a. Annual Gas Depreciation Scenarios as of December 2021 Based on CLCPA Assumptions (KEDLI)

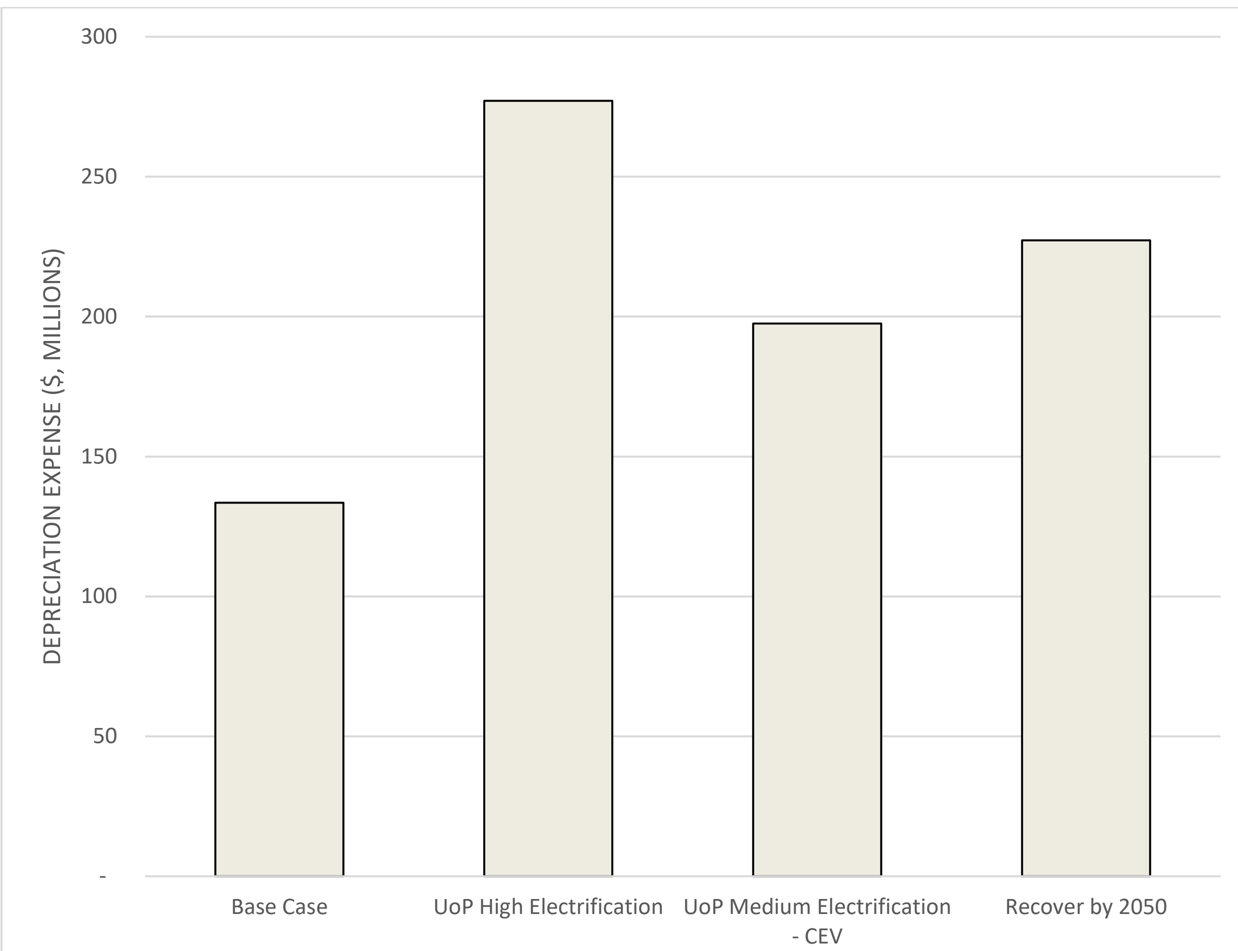


Figure 5b. Annual Gas Depreciation Scenarios as of December 2021 Based on CLCPA Assumptions (KEDNY)

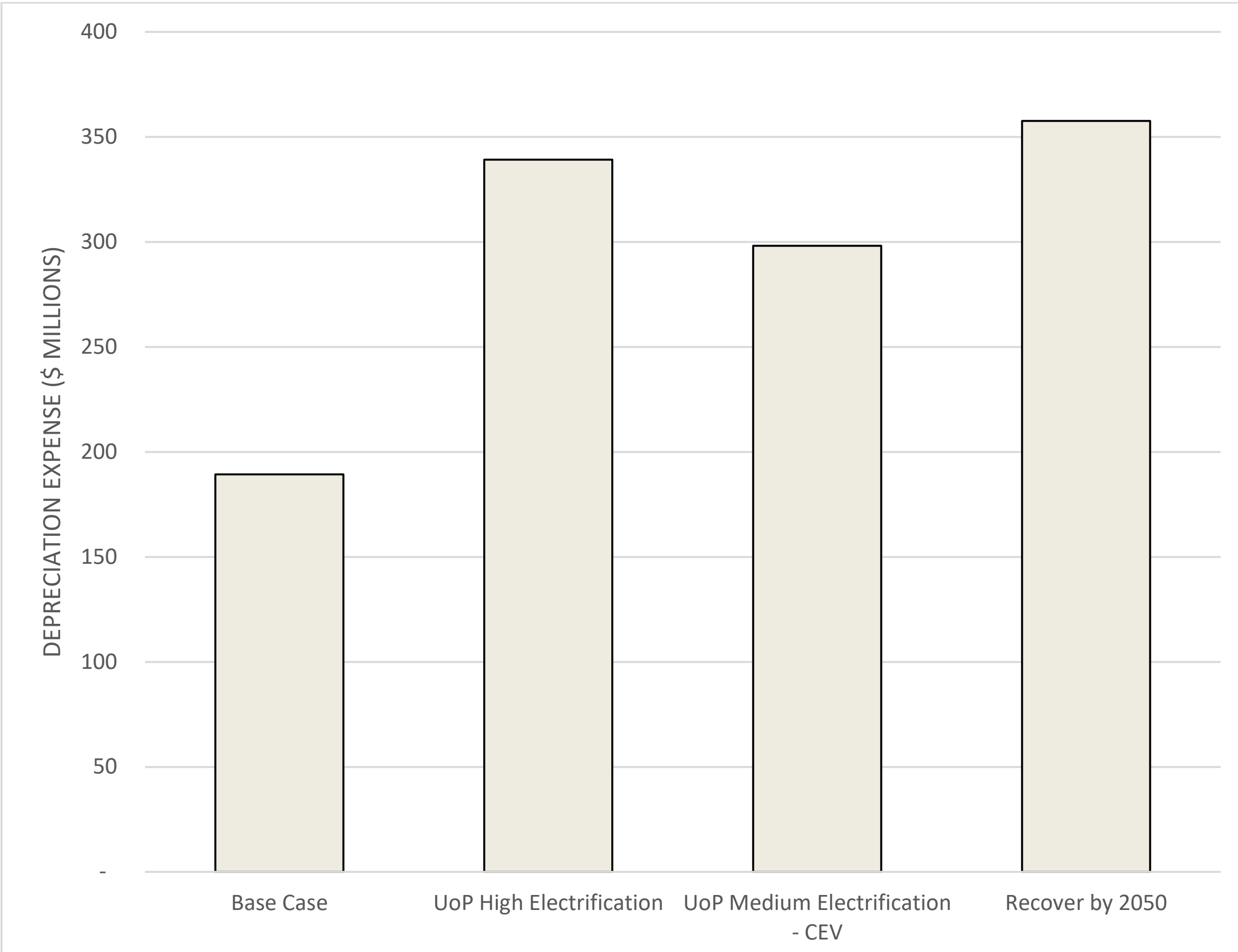
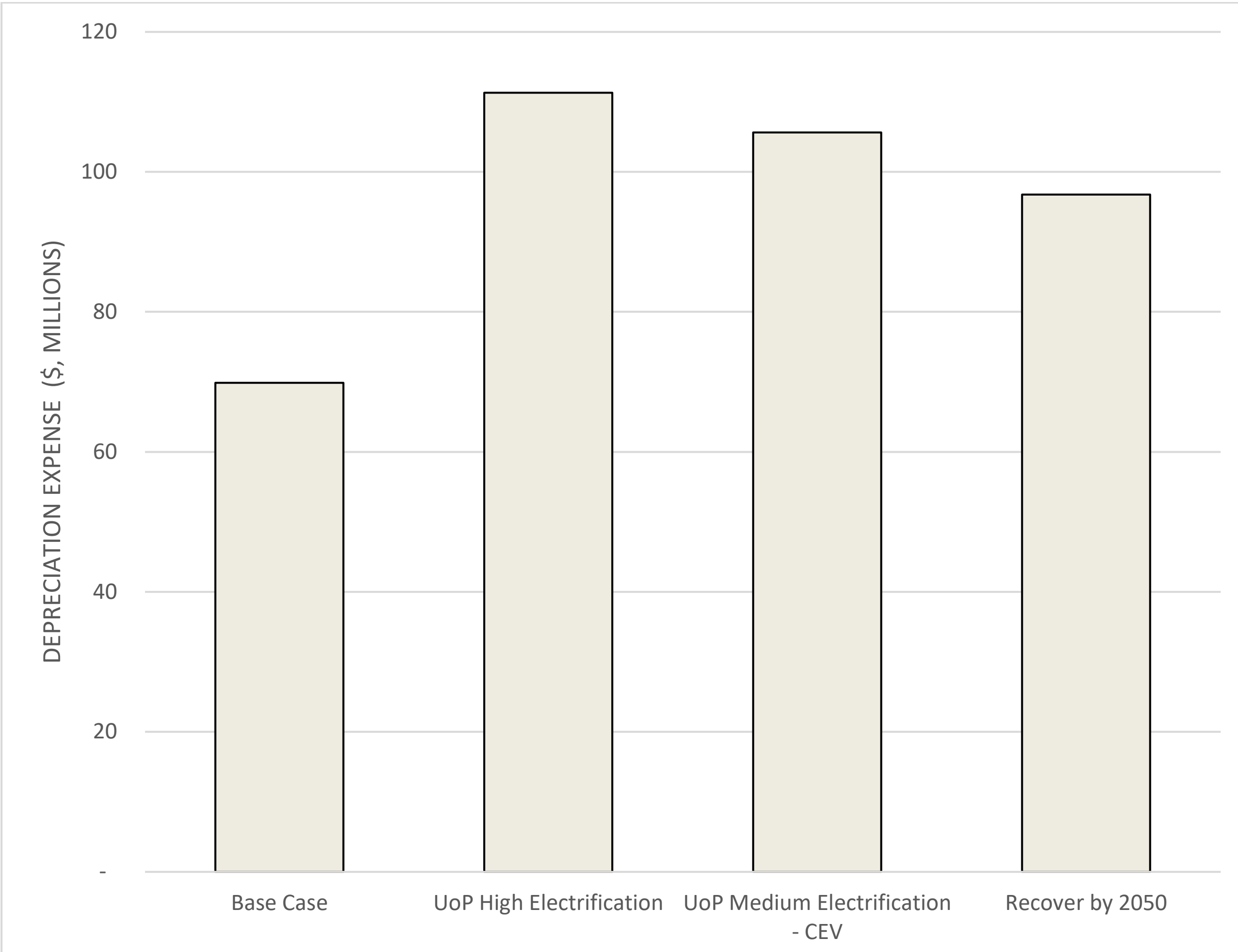


Figure 5c. Annual Gas Depreciation Scenarios as of December 2021 Based on CLCPA Assumptions (NMPC)



The base case and recover all by 2050 scenarios use the straight line method and whole life technique for calculating depreciation. Figures 5a, 5b, and 5c above illustrate that there is a substantial difference between the business-as-usual approach (*i.e.,* the currently approved or base case scenario) and the units of production method or recovering all costs by the year 2050.

The recover all by 2050 scenario results in an increase of about 35 percent to 90 percent in depreciation expense (depending on the operating company analyzed), which translates to an approximate delivery bill increase of around 5 percent to 12 percent compared to base case depreciation levels. However, this scenario does not fully capture the impact of a situation in which most, if not all, customers leave the system by 2050. The actual impact in such a scenario would be even higher because many customers would likely leave before 2050, requiring a more accelerated recovery pattern than simply recovering costs on a straight line basis by 2050.

In addition to modifying service lives, a change to the depreciation method can also be used to address issues arising from the CLCPA. To illustrate alternative methodologies, the UoP – high electrification scenario was calculated. Because the UoP method allocates costs in proportion to consumption, rather than in equal amounts each year, the overall recovery pattern is different from those scenarios which use the straight line method. As a result, in some instances the UoP method produces higher depreciation in the short-term than even the recover all by 2050 scenario.

The throughput assumptions used as the units of production inputs are generally consistent with those set forth in the Gas Planning Order and are based on the throughput forecasts provided by National Grid. Based on our experience, the high electrification scenario is within the range of forecasts we have seen for declines in gas demand, depending on the scale of electrification. Importantly, we note that this scenario uses the same service lives as in the base case scenario.

An additional units of production scenario was run based on National Grid's medium electrification - CEV vision. The declines in gas throughput and customer counts were also provided by National Grid and are less significant than the high electrification scenario. Consequently, the calculated depreciation in this scenario represents a more moderate increase over current rates.

These scenarios help illustrate the depreciation impact of various assumptions about how New York achieves its decarbonization goals. If gas demand and customers were to follow the high electrification scenario by 2050, then depreciation should be around 60 percent to 100 percent higher than the base case depreciation rates, depending on the operating company. These increases in depreciation rates translate to an overall delivery rate increase of about 8 to 15 percent for National Grid customers compared to base case depreciation levels. One can interpret these analyses to mean that the CLCPA could potentially result in bill increases of 8 to 15 percent or more due only to the change in depreciation, based on the business assumptions for the high electrification scenario.

There is one additional item to note for these scenarios regarding the units of production method. If there is a decline in gas demand, it is uncertain whether this will be the result of the loss of customers, lower per-customer demand, or a combination of the two. Indeed, in several areas of National Grid's service territories we would expect that, at a minimum, gas will be needed in a more limited way to provide reliable heating on very cold days. The units of production method addresses an issue that focusing only on asset lives will not address. If future customers use electricity for most heating days but gas for the coldest days, then they will receive less service from many of the same assets. It is equitable for current customers to pay for infrastructure from which they receive a much larger service. The units of production method addresses this issue even if the physical assets continue to have relatively long lives.

The units of production method also helps to address a different issue in which customers potentially leave the system in a haphazard and inefficient manner. Consider a scenario in which a city street is served by a single gas main. Each customer on that street would have their own gas service and meter, but all are served from the same gas main. If, for example, half of the customers electrify their energy usage and leave the gas system, National Grid would retire their services and meters, but the gas main would need to remain to provide service to those customers who remain. Using straight line depreciation, these customers would pay a higher share of the cost of the gas main than those that left the system. If, however, units of production were used, then depreciation would be adjusted for the decline in throughput and costs would be allocated more equally across the customer base – both those that leave and those who remain.

2022-2050 Results

Business as Usual

To establish a baseline, the first scenario to consider is the business as usual scenario, in which it is assumed that there is no decline in customers or throughput. Under normal operations, revenue requirements tend to grow over time due to growth in capital expenditures to keep pace with inflation and new business. Our modeling of revenue requirements through 2050 for the business as usual case results in this expected pattern:

Figure 6a. Projected Revenue Requirement Components By Year Business as Usual Scenario (KEDLI)

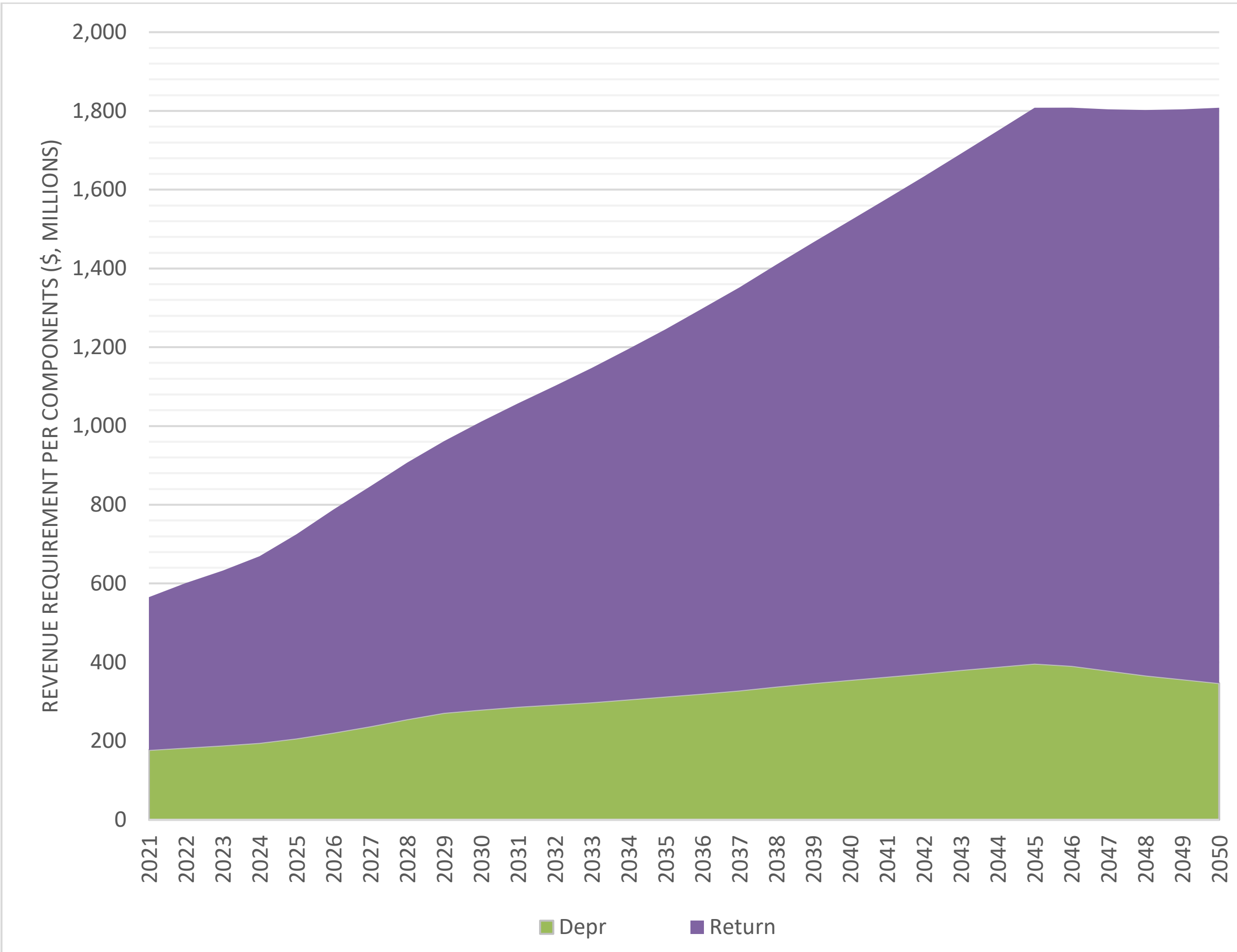


Figure 6b. Projected Revenue Requirement Components By Year
Business as Usual Scenario (KEDNY)

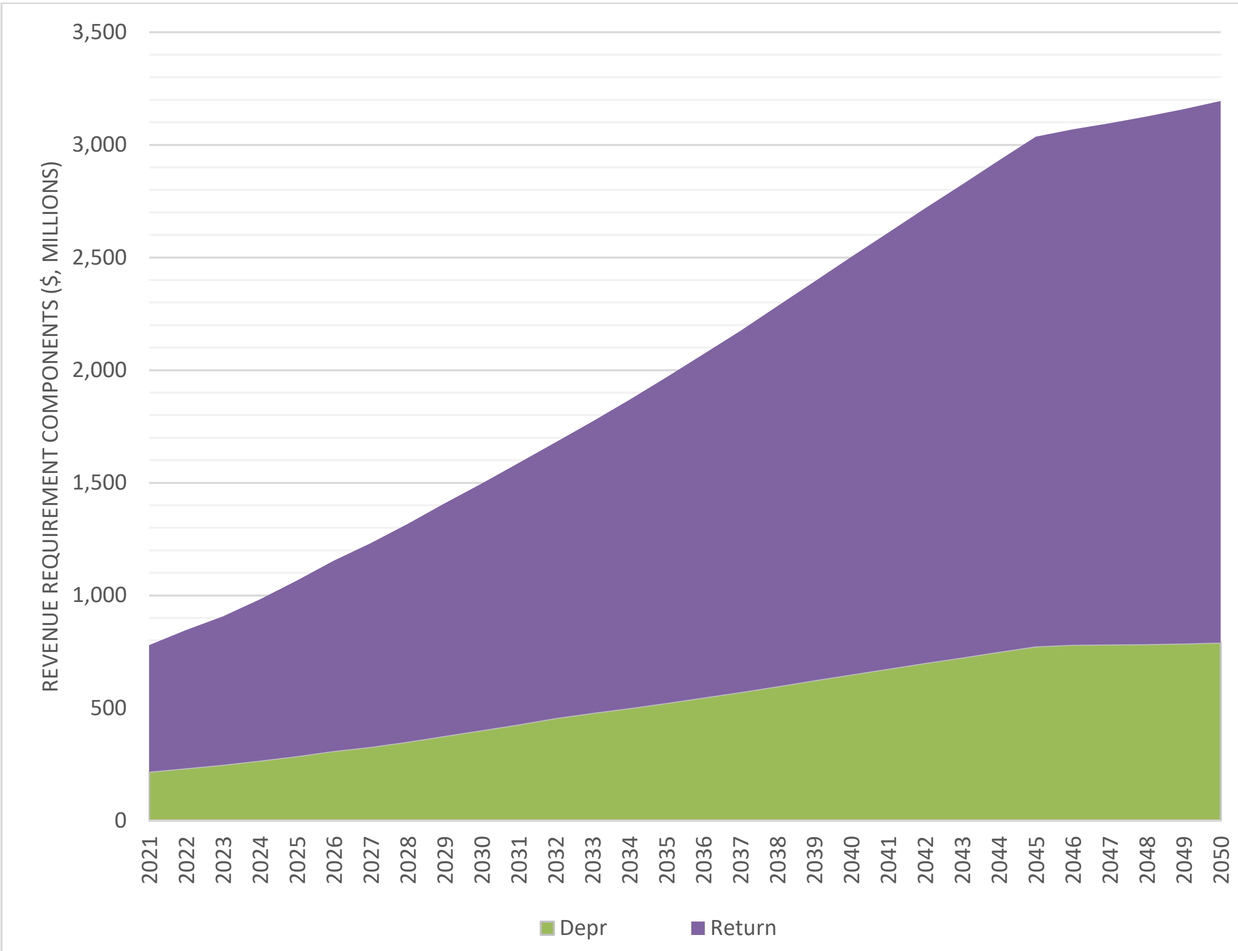
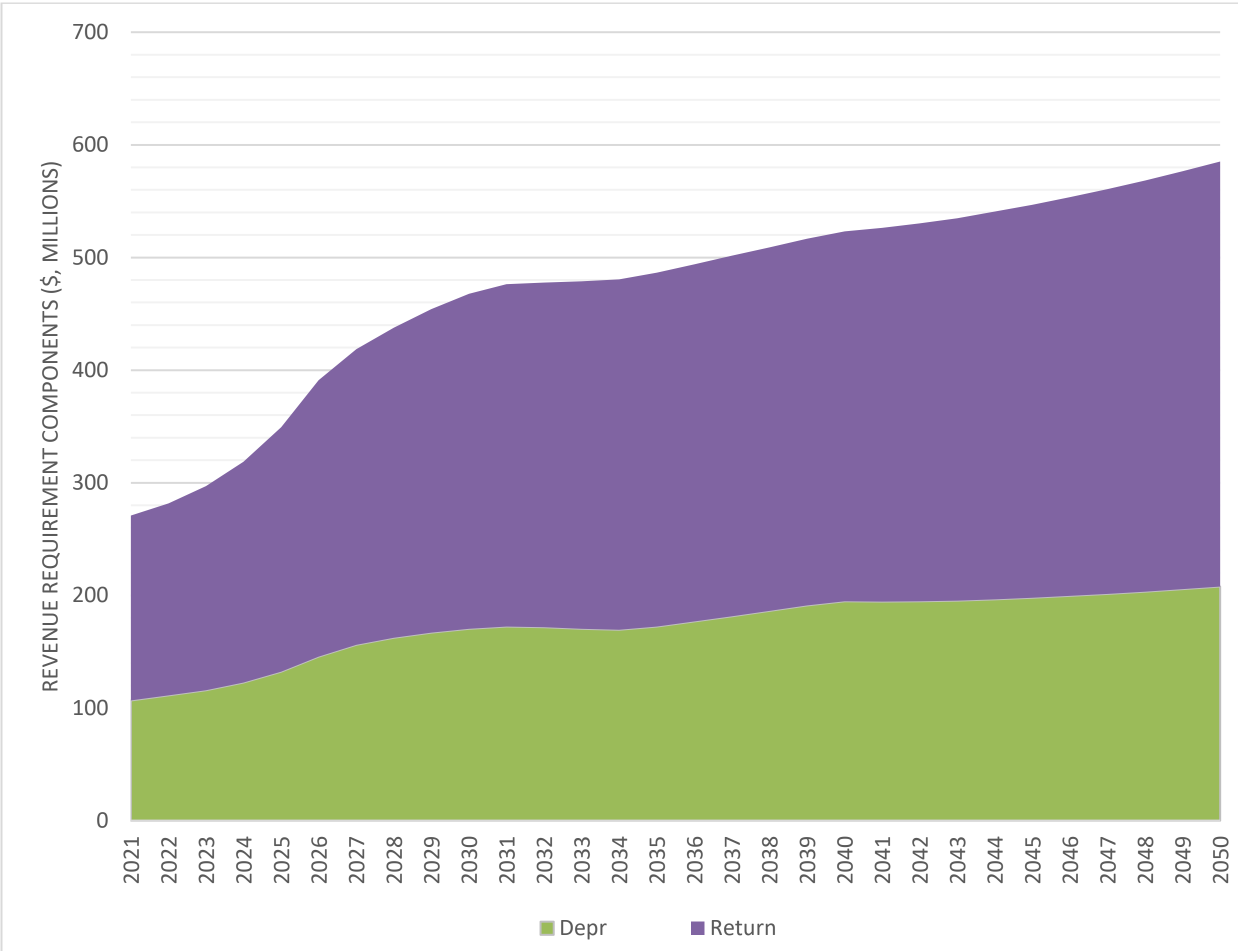


Figure 6c. Projected Revenue Requirement Components By Year Business as Usual Scenario (NMPC)



Figures 6a, 6b, and 6c above show changes in the revenue requirement by component from 2021 through 2050 based on the use of straight line depreciation with no adjustments to service lives. These projections follow a similar pattern both for the total revenue requirement and for our proxy for bill impacts, which is the revenue requirements divided by the number of customers, as the customer counts are relatively stable over this period for the business as usual scenario.

High Electrification

The next set of business assumptions modeled is the scenario set forth in the Gas Planning Order, in which both customer counts and gas throughput decline based on each operating company's given inputs. As discussed above, several depreciation scenarios were modeled based on this set of business assumptions. The first was to model the impacts of continuing to use straight line depreciation with no adjustments to service lives – effectively, to continue with "business as usual" depreciation methodology despite the changing business assumptions. Figures 7a, 7b, and 7c below provide the revenue requirement results on a per customer basis using straight line depreciation with no service life adjustments to the high electrification set of business assumptions. These results are also shown in comparison to the business as usual scenario shown in the previous section.

Figure 7a. Projected Revenue Requirement Per Customer
Business as Usual vs High Electrification - Straight Line (KEDLI)

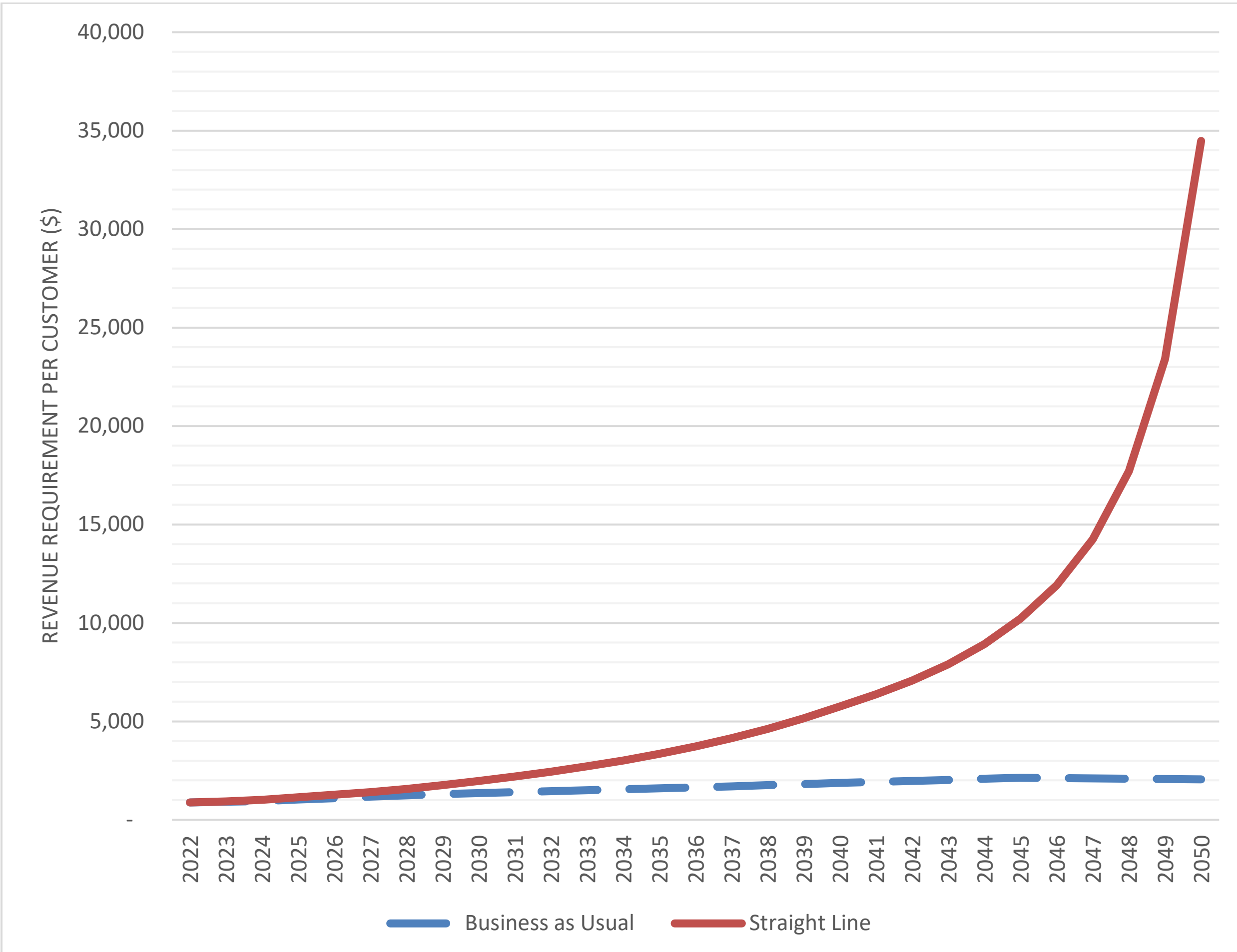


Figure 7b. Projected Revenue Requirement Per Customer
Business as Usual vs High Electrification - Straight Line (KEDNY)

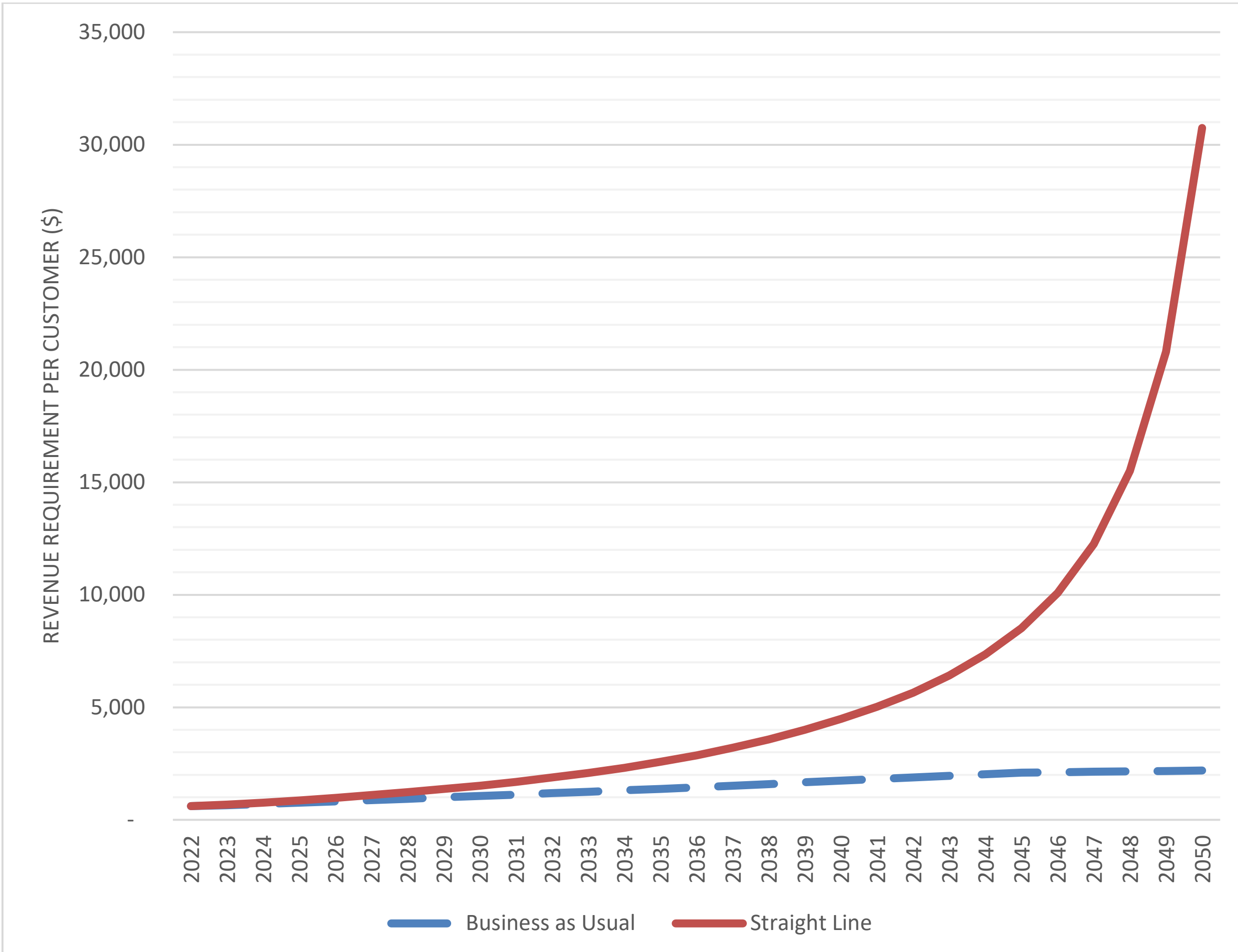
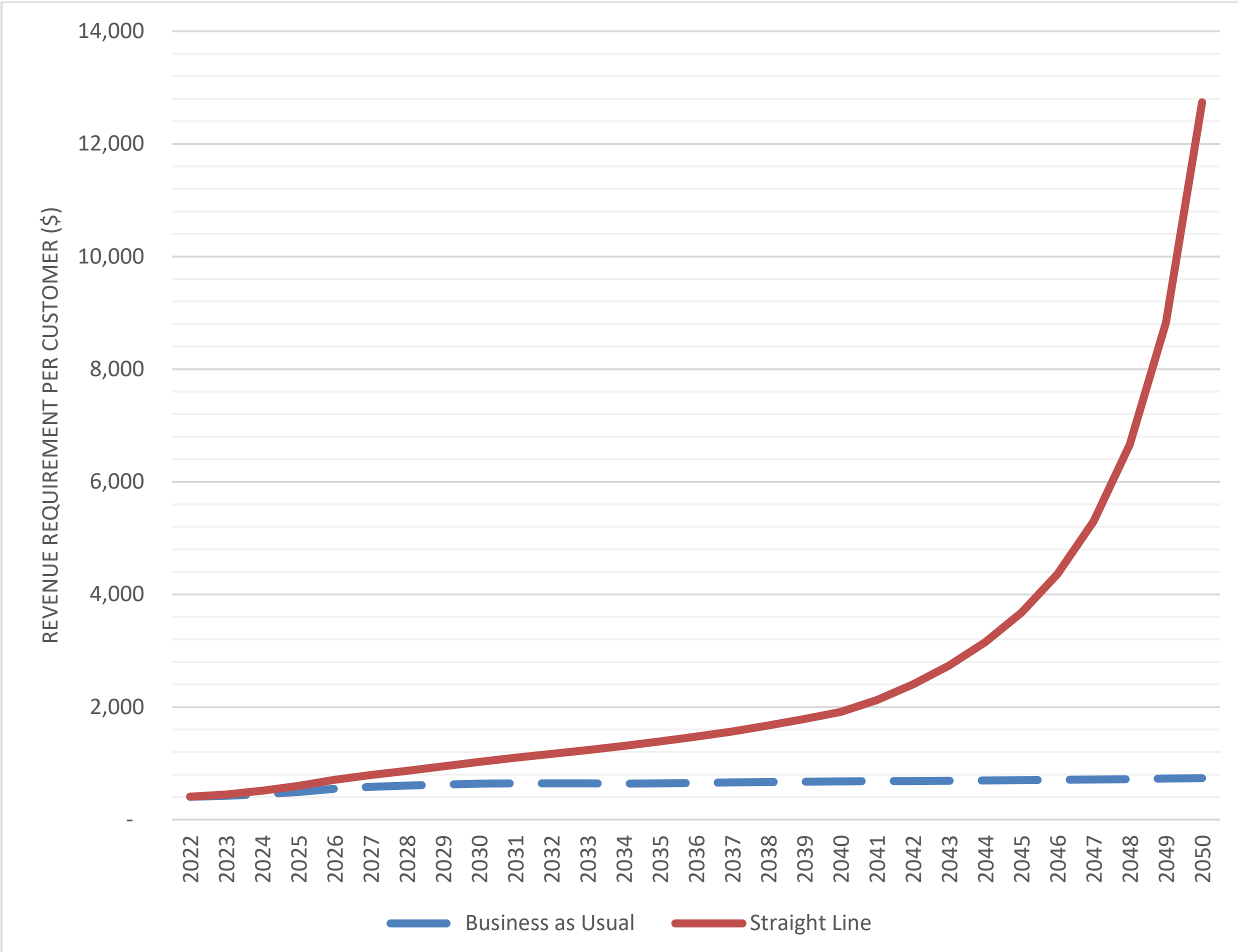


Figure 7c. Projected Revenue Requirement Per Customer
Business as Usual vs High Electrification - Straight Line (NMPC)



The charts help to illustrate that the change to business assumptions has a significant impact on future revenue requirements and bill impacts. One interpretation is that the CLCPA, at least if it results in a high electrification scenario, could cause customer bills to increase significantly. The various depreciation approaches modeled do not change this reality but instead affect how these bill impacts are distributed and shared over time.

Figures 8a, 8b, and 8c below provides a comparison of each of the different depreciation scenarios modeled for the high electrification set of business assumptions.

Conceptually, these follow expected patterns. While units of production for this scenario produces the highest depreciation and highest revenue requirement initially, it also produces the lowest revenue requirement (both in total and per-customer) in future years.

Figure 8a. Projected Revenue Requirement Per Customer
High Electrification - All Scenarios (KEDLI)

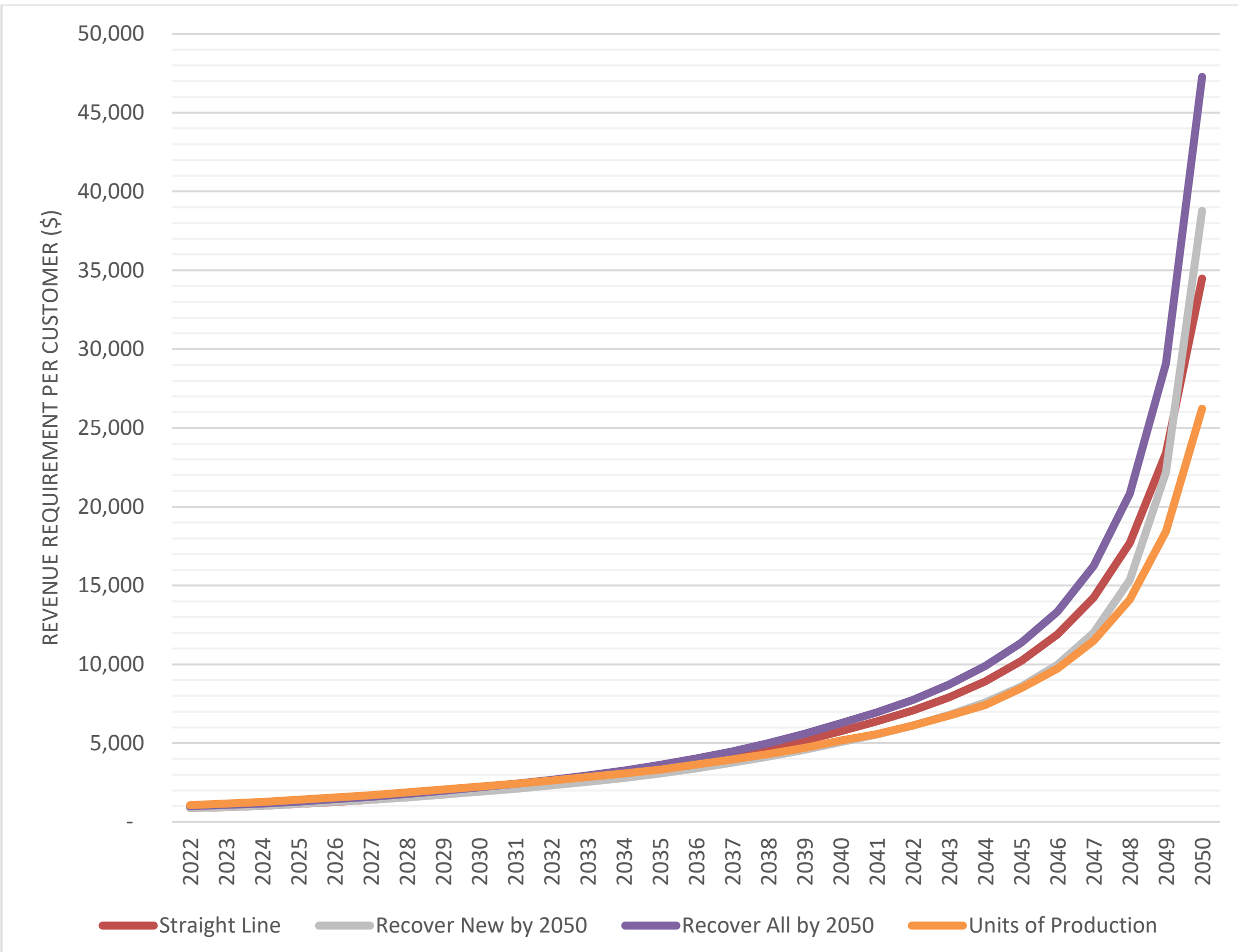


Figure 8b. Projected Revenue Requirement Per Customer
High Electrification - All Scenarios (KEDNY)

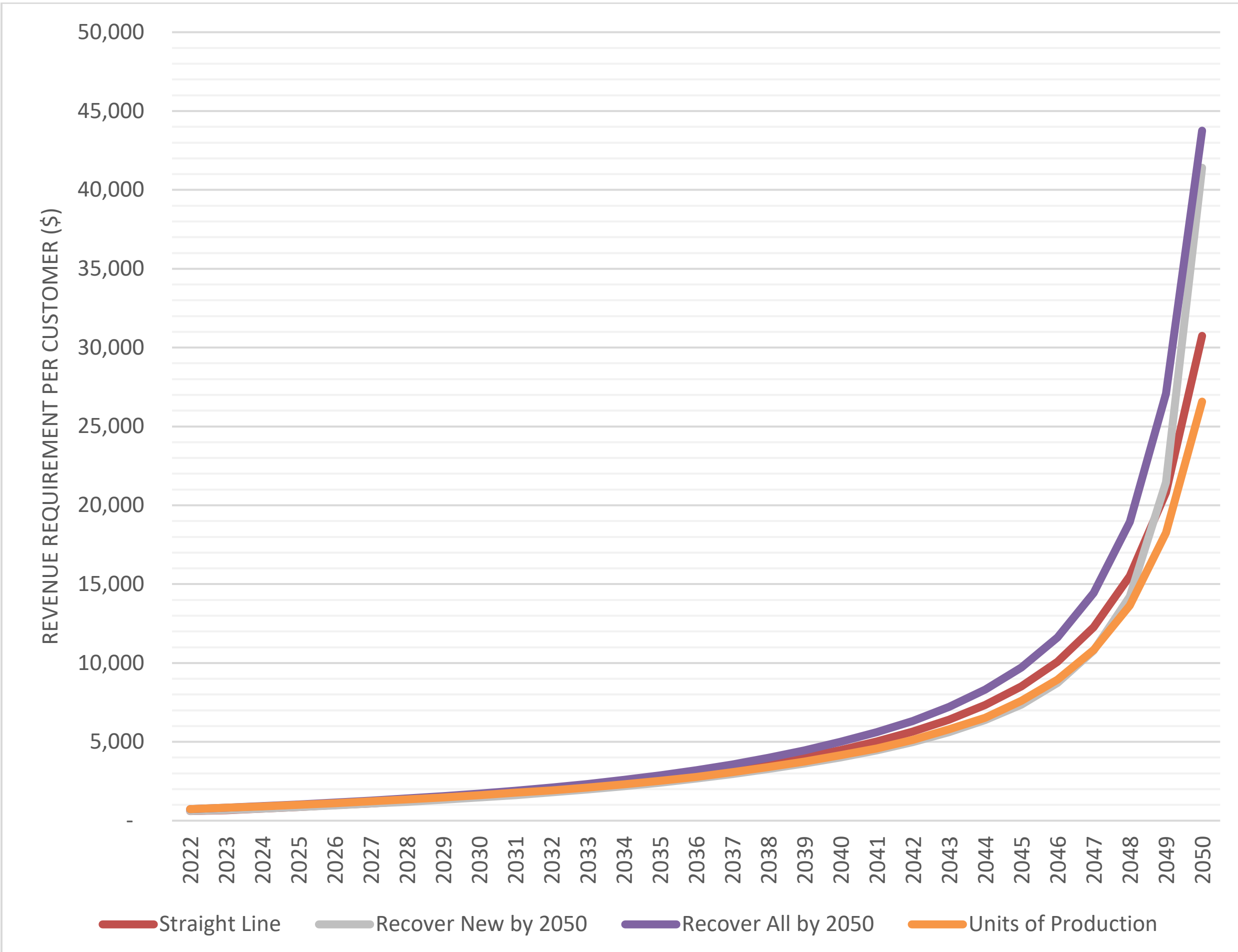
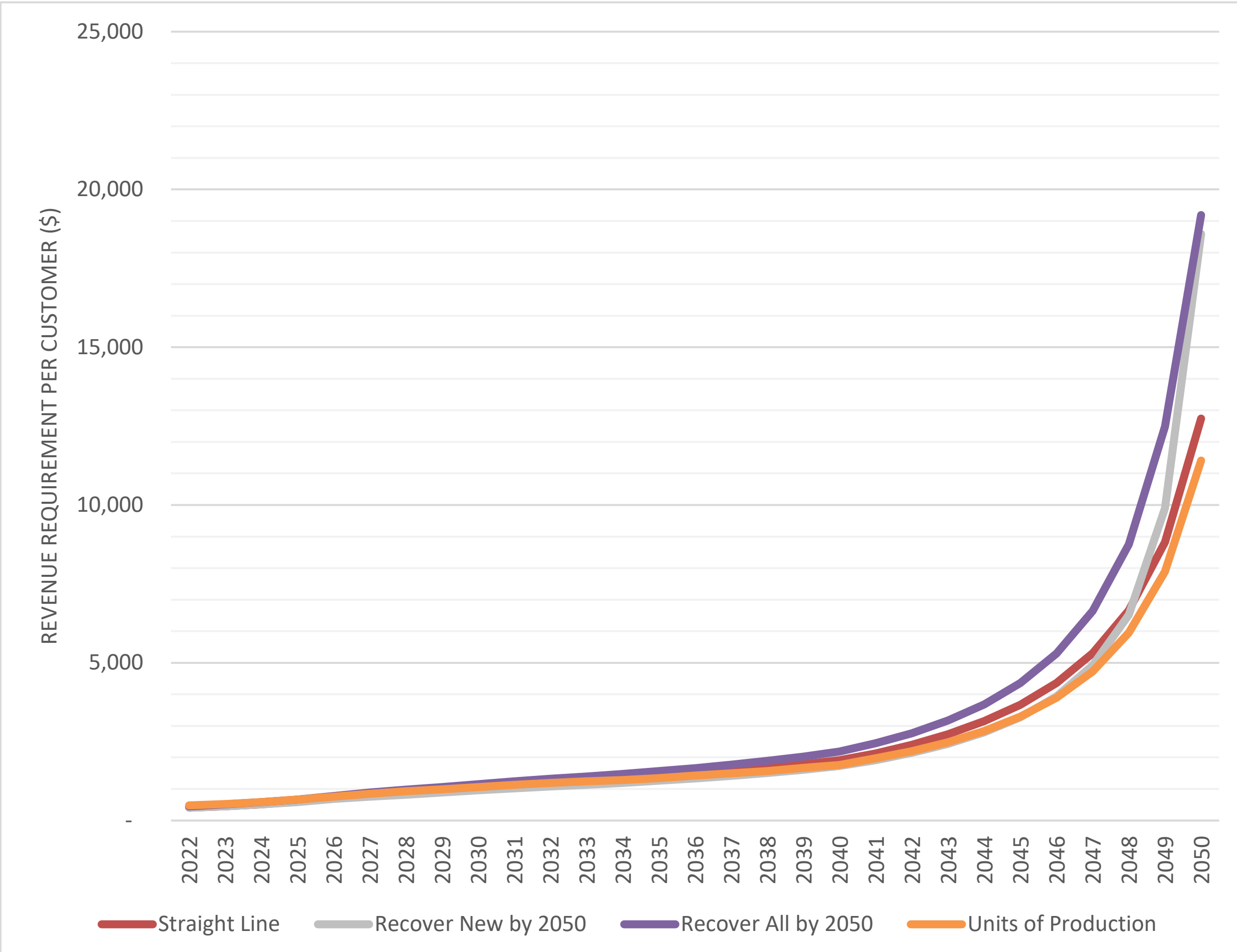


Figure 8c. Projected Revenue Requirement Per Customer
High Electrification - All Scenarios (NMPC)



However, this is not the full extent of the impact. Each depreciation scenario results in different rate base levels at the conclusion of 2050. That is, depending on the deprecation scenario, the amounts remaining to recover through depreciation will vary, as will the rate base on which National Grid would earn a return. Figures 9a, 9b, and 9c below provide the rate base in 2050 for each depreciation scenario based on the high electrification business assumptions. As the charts shows, rate base in 2050 is projected to be at least 15 percent higher for all companies using straight line depreciation with no adjustment to service lives than if the units of production method were used. This means that, if the straight line method is used instead of units of production, not only will customer bills be significantly higher in 2050 but because there will be significantly more remaining costs to recover, bills would need to remain higher after 2050 as well.

Figure 9a. Projected Rate Base As Of 2050
High Electrification (KEDLI)

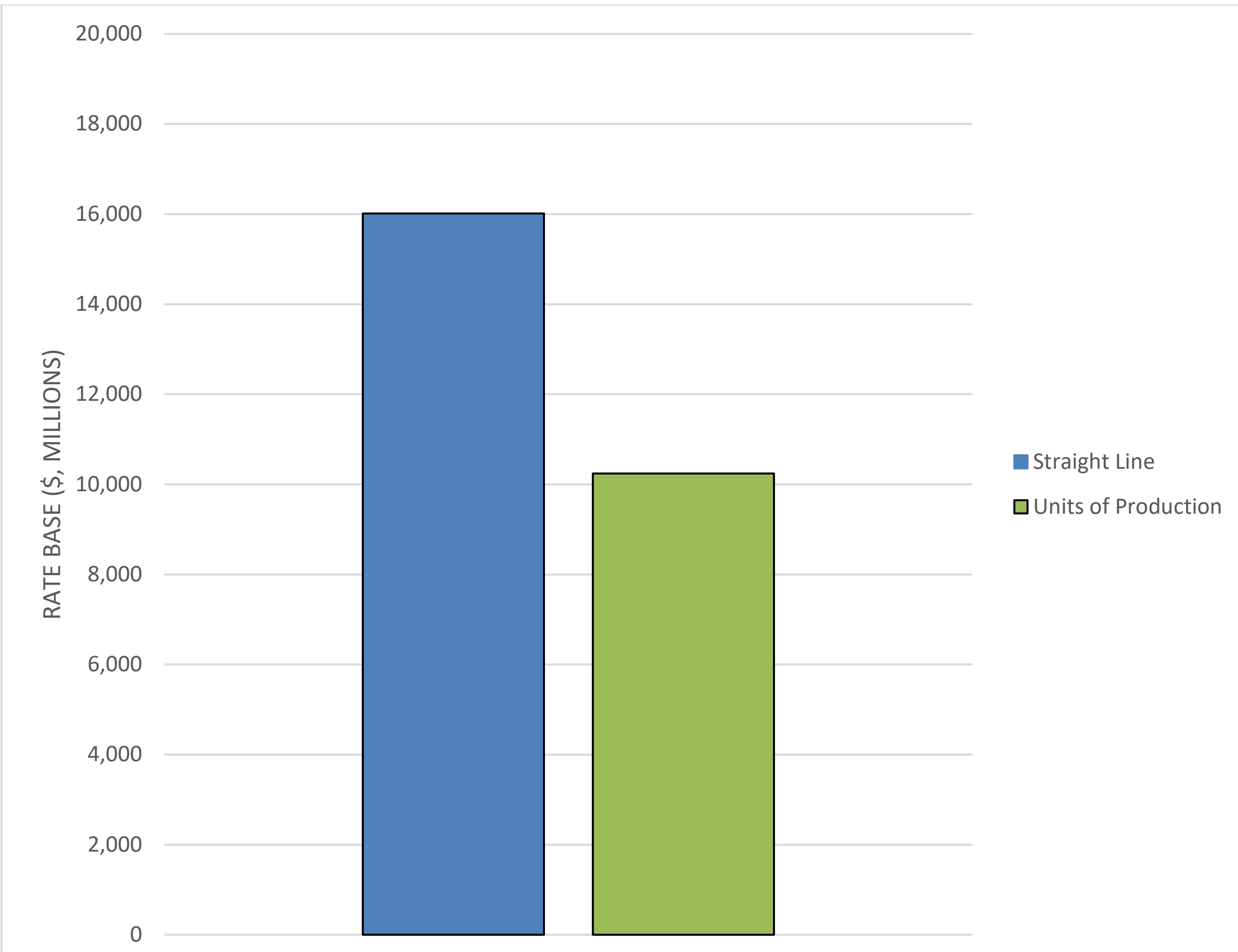


Figure 9b. Projected Rate Base As Of 2050
High Electrification (KEDNY)

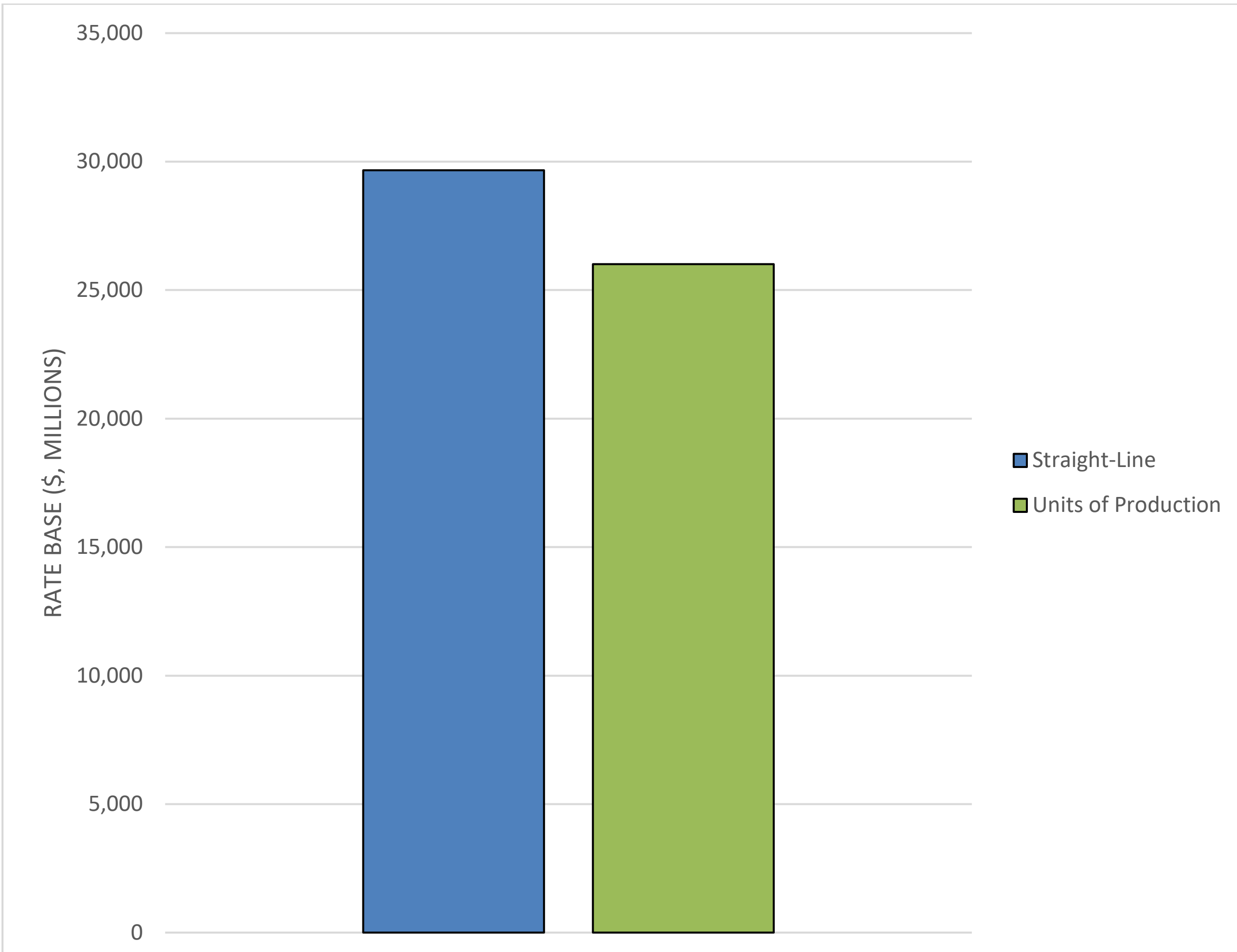
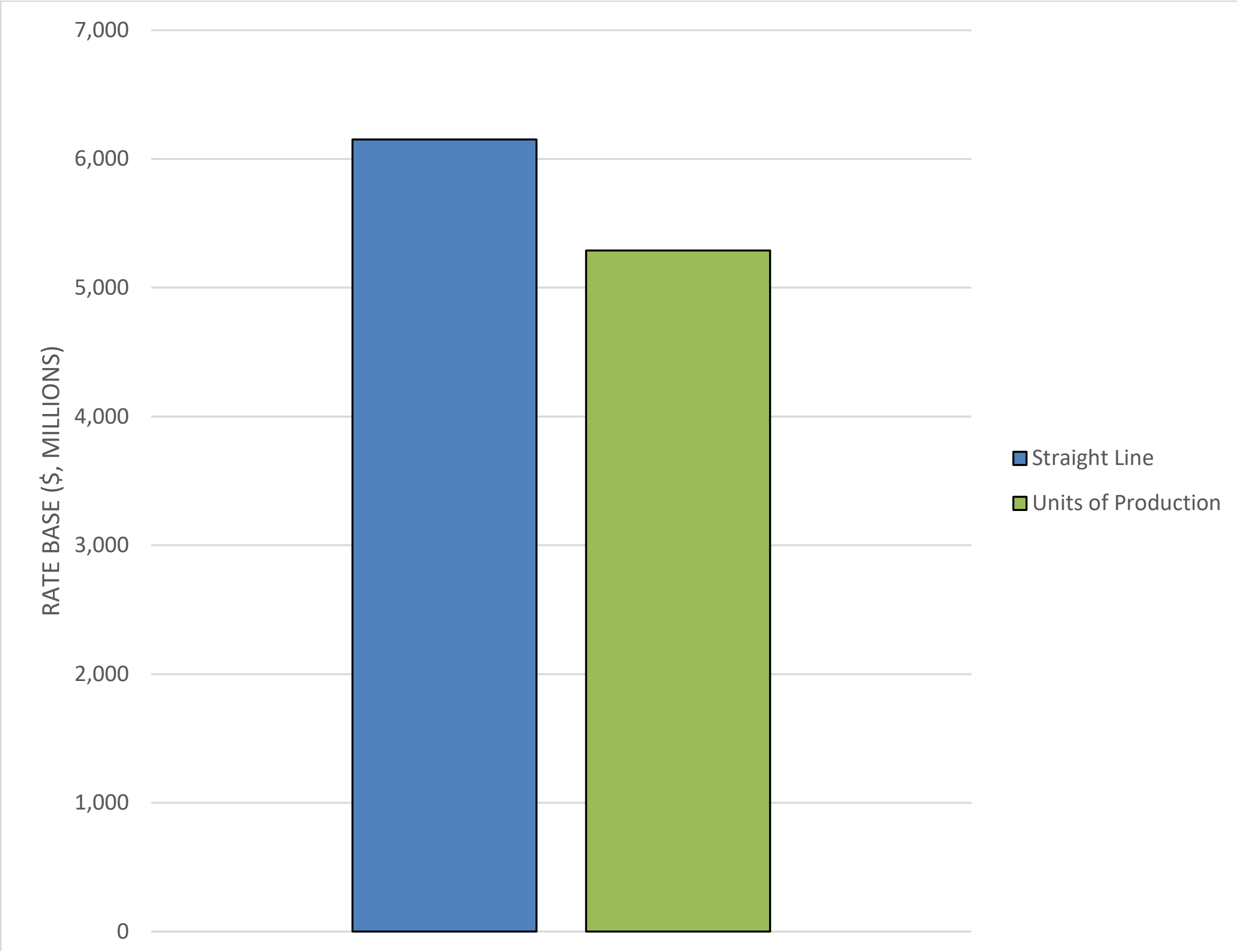


Figure 9c. Projected Rate Base As Of 2050
High Electrification (NMPC)



Medium Electrification - CEV

The final set of business assumptions modeled is the “medium electrification - CEV” scenario, in which customer counts decline based on the company’s provided customer count and throughput. As was done in the high electrification business case, several depreciation scenarios were modeled based on this set of business assumptions. Figures 10a, 10b, and 10c below provide the revenue requirement results on a per customer basis using straight line depreciation with no service life adjustments to medium electrification - CEV set of business assumptions. These results are also shown in comparison to the business as usual scenario.

Figure 10a. Projected Revenue Requirement Per Customer
Business as Usual vs Medium Electrification - CEV - Straight Line (KEDLI)

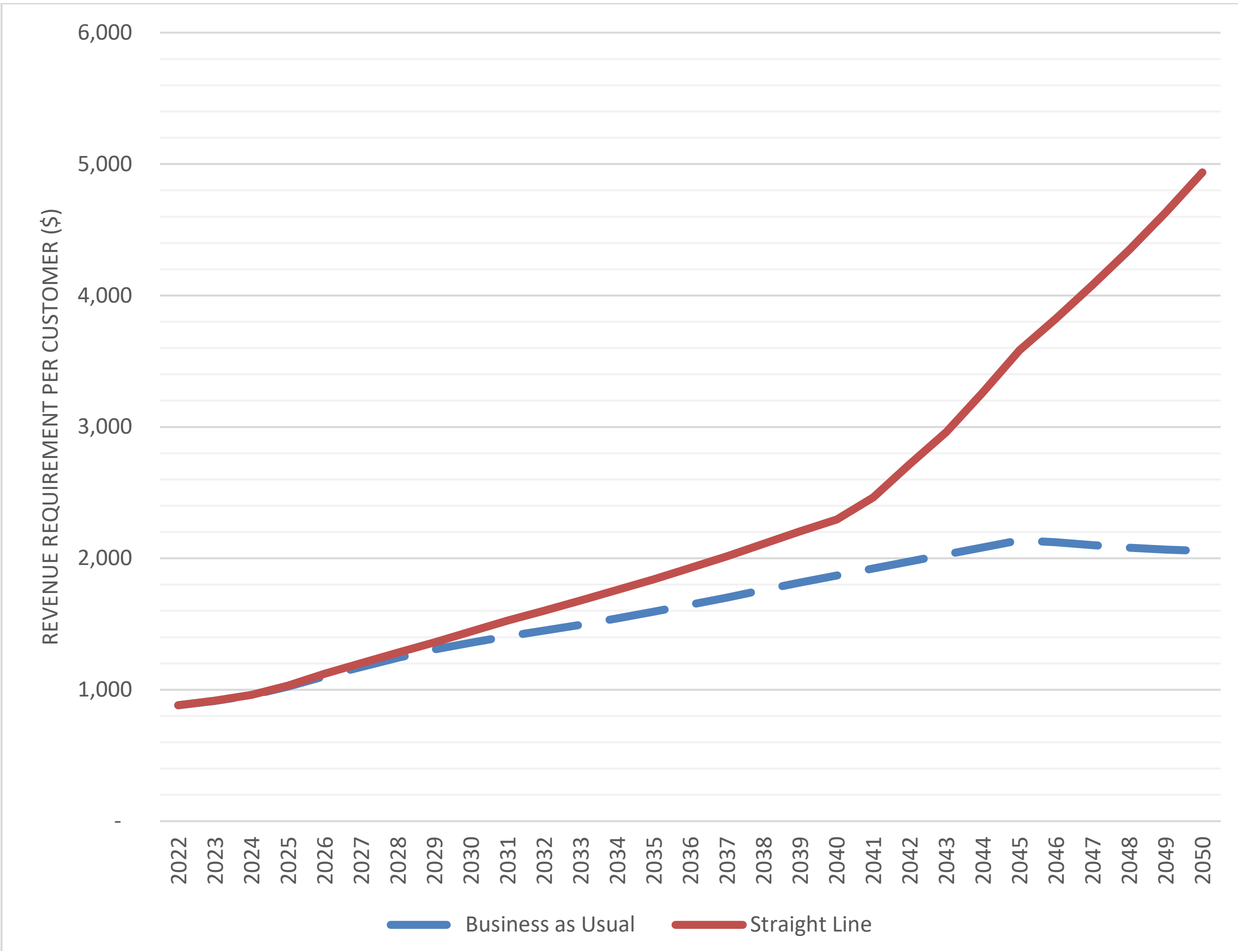


Figure 10b. Projected Revenue Requirement Per Customer
Business as Usual vs Medium Electrification - CEV Gas - Straight Line (KEDNY)

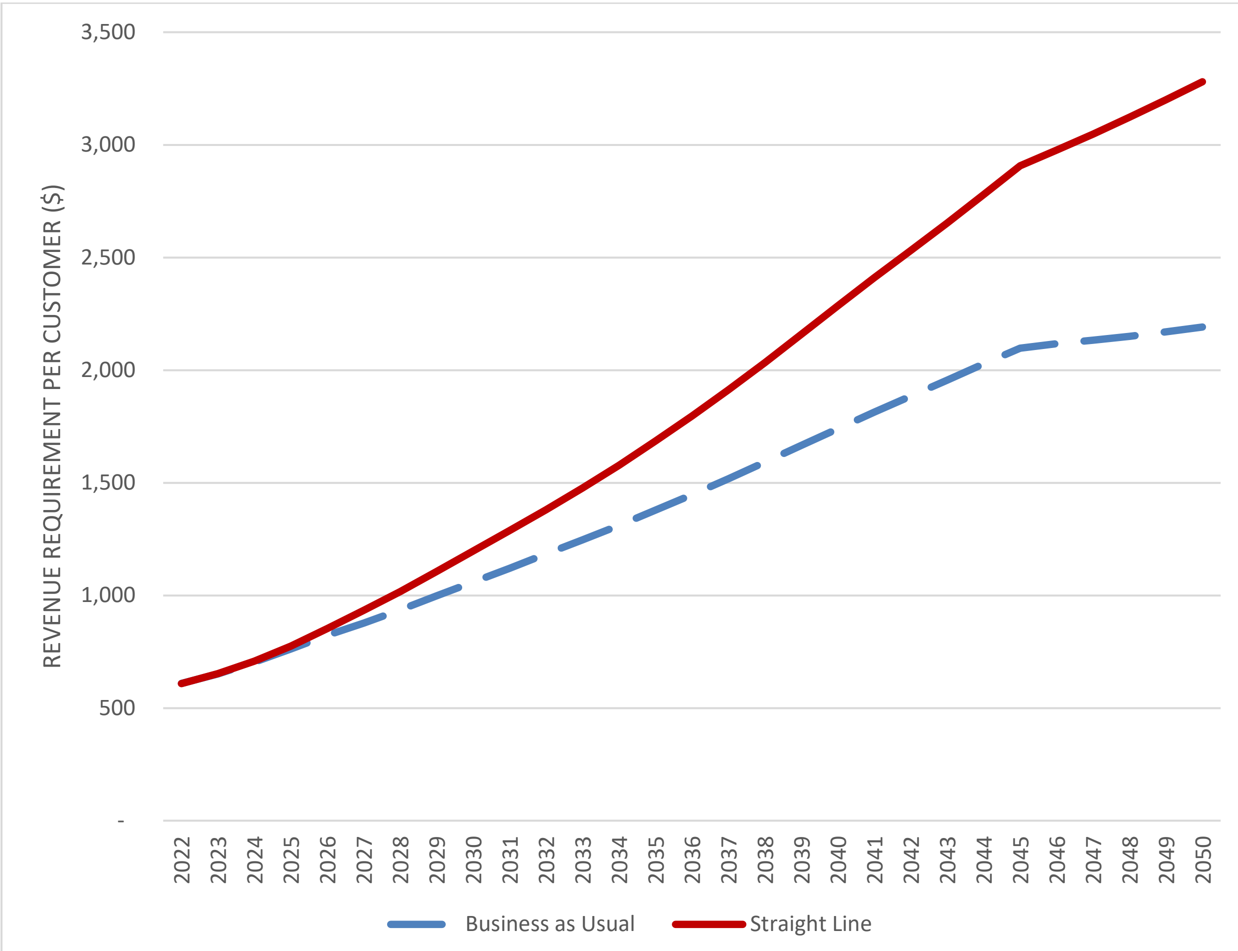
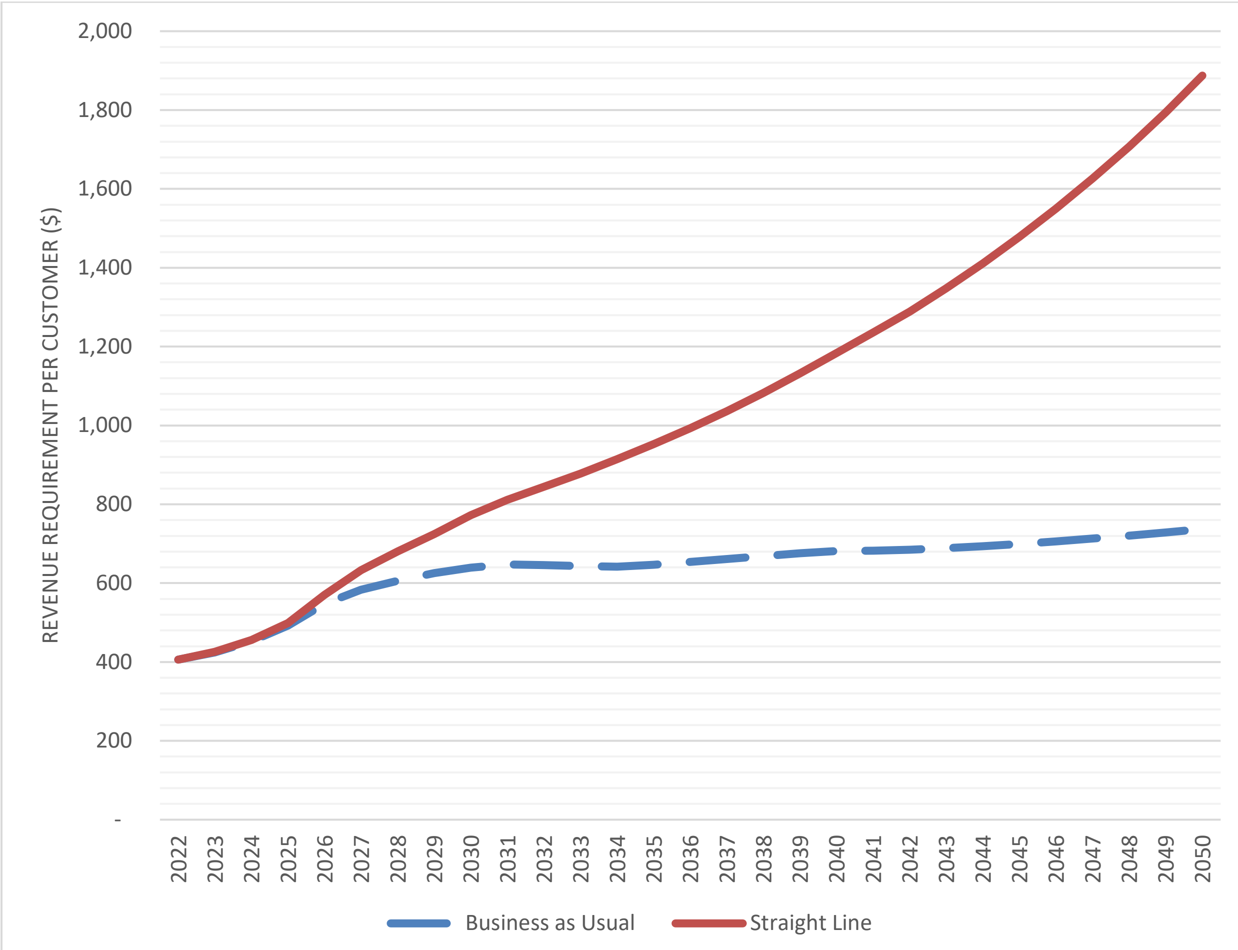


Figure 10c. Projected Revenue Requirement Per Customer
Business as Usual vs Medium Electrification - CEV Gas - Straight Line (NMPC)



As these figures illustrate, if the CLCPA results in something approximating the medium electrification - CEV scenario, customer bills will increase. However, the bill impact will be less significant than the increase under the high electrification scenario.

Figures 11a, 11b, and 11c below provide a comparison of each of the different depreciation scenarios modeled for the medium electrification - CEV set of business assumptions.

Figure 11a. Projected Revenue Requirement Per Customer
Medium Electrification - CEV – Straight Line and UoP Scenarios (KEDLI)

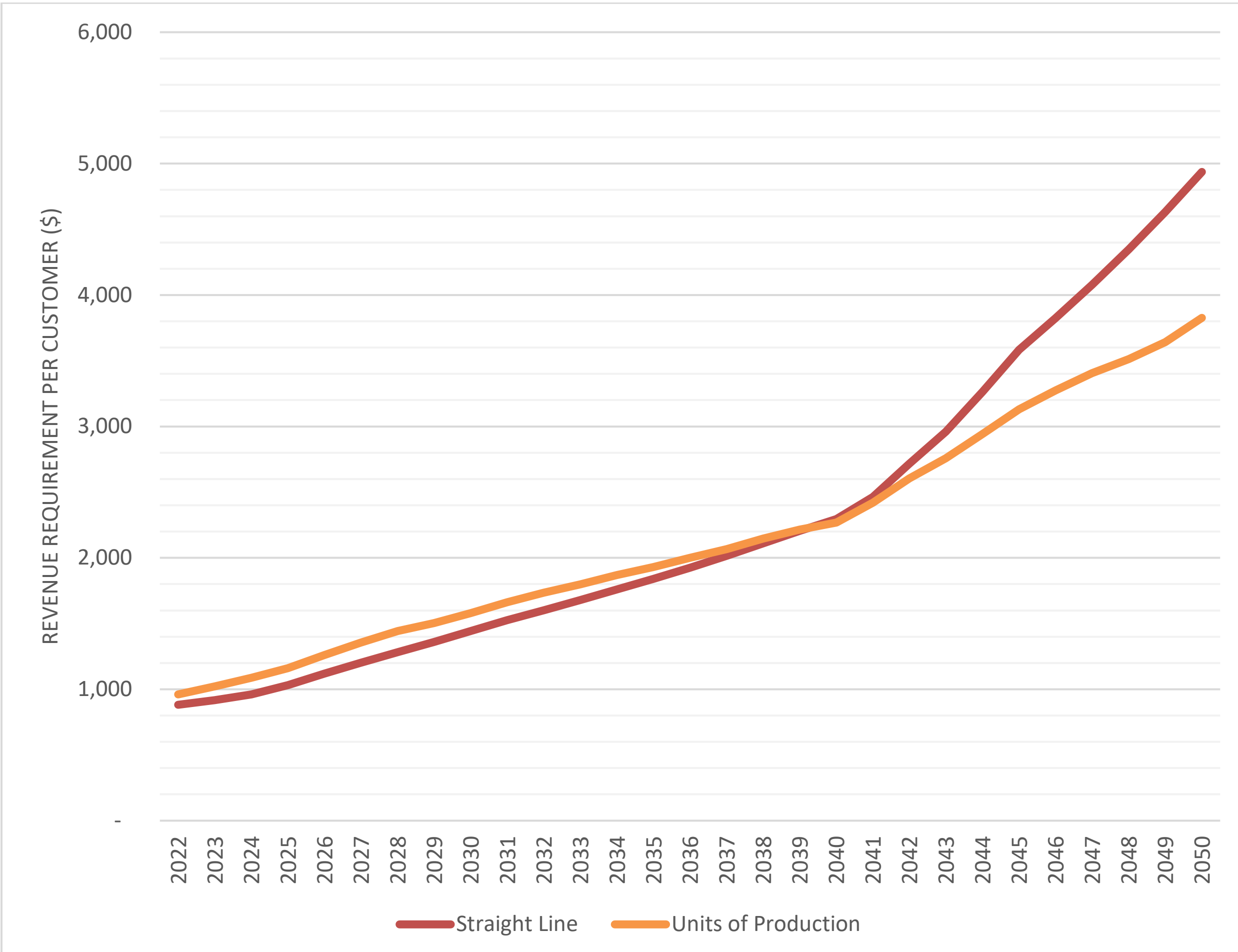


Figure 11b. Projected Revenue Requirement Per Customer
Medium Electrification - CEV – Straight Line and UoP Scenarios (KEDNY)

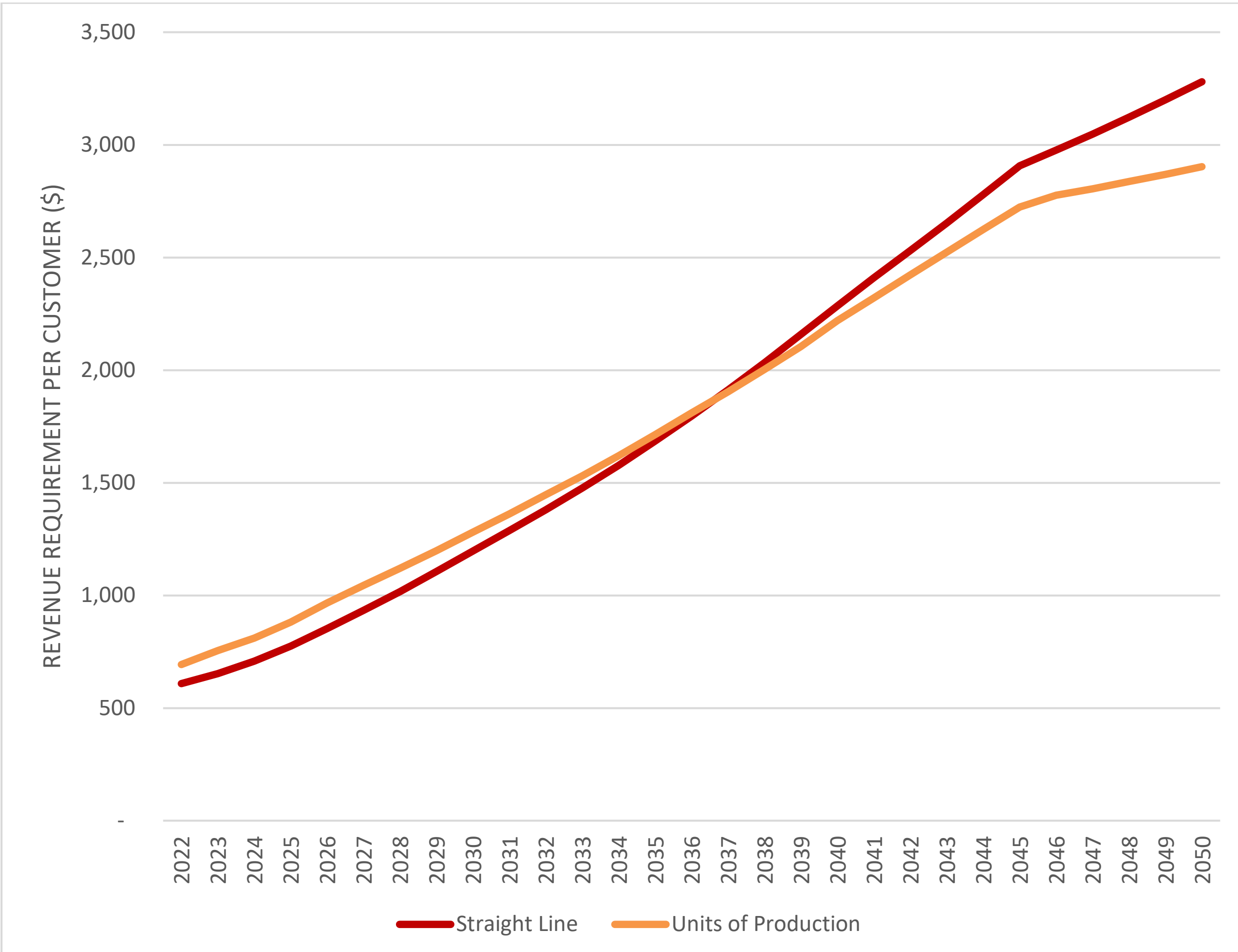
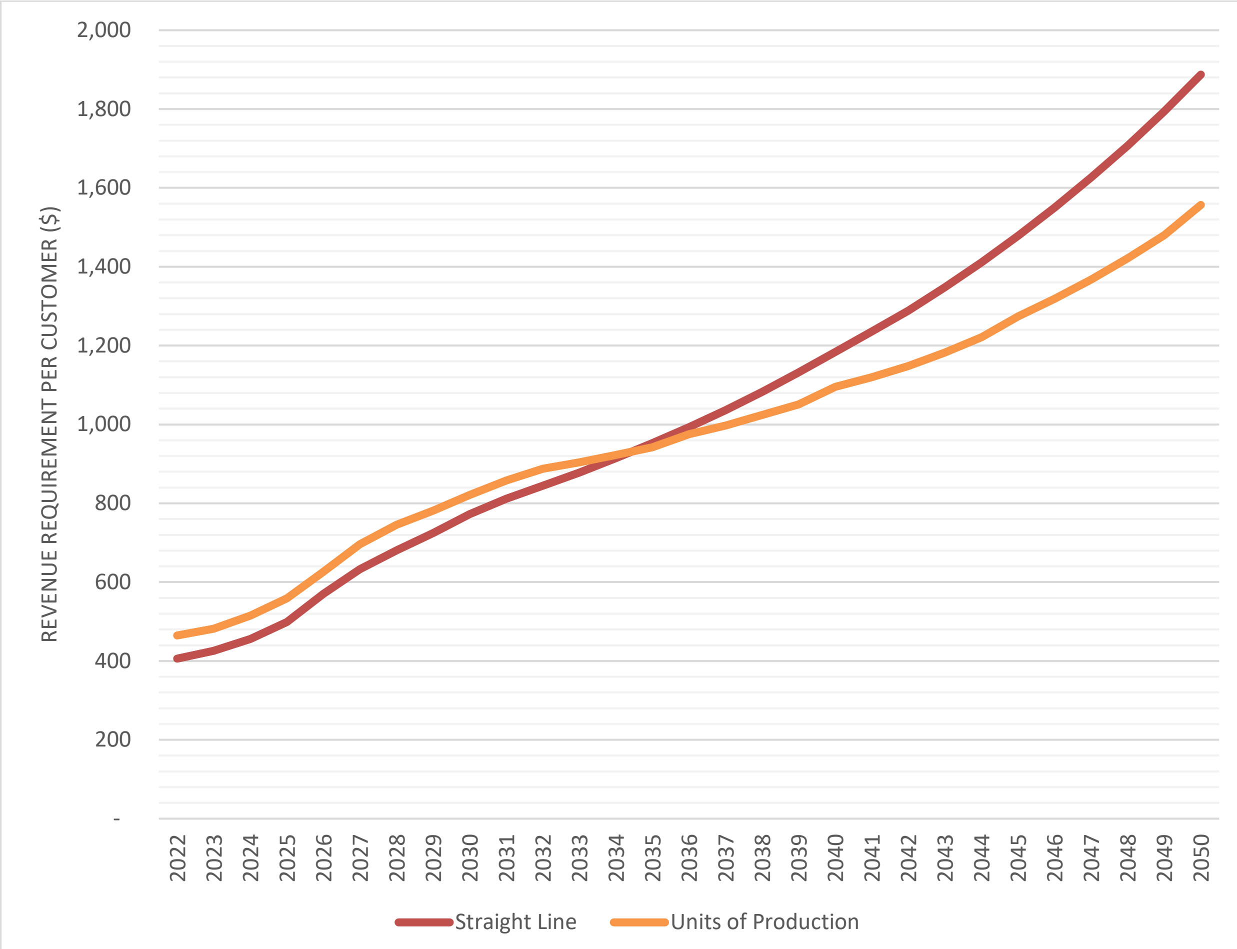


Figure 11c. Projected Revenue Requirement Per Customer
Medium Electrification - CEV – Straight Line and UoP Scenarios (NMPC)



Notice that the total revenue requirement per customer is less than the high electrification scenario under all calculations. The output from the straight line and units of production methodologies is also more consistent than in the high electrification scenario since a less significant decline in gas throughput produces a lower overall depreciation rate based on the units of production method.

Figures 12a, 12b, and 12c below provide the rate base in 2050 for each depreciation scenario based on the medium electrification - CEV business assumptions.

Unlike the high electrification scenario, the difference in rate base is not as dramatic between depreciation approaches.

Figure 12a. Projected Rate Base As Of 2050
Medium Electrification - CEV (KEDLI)

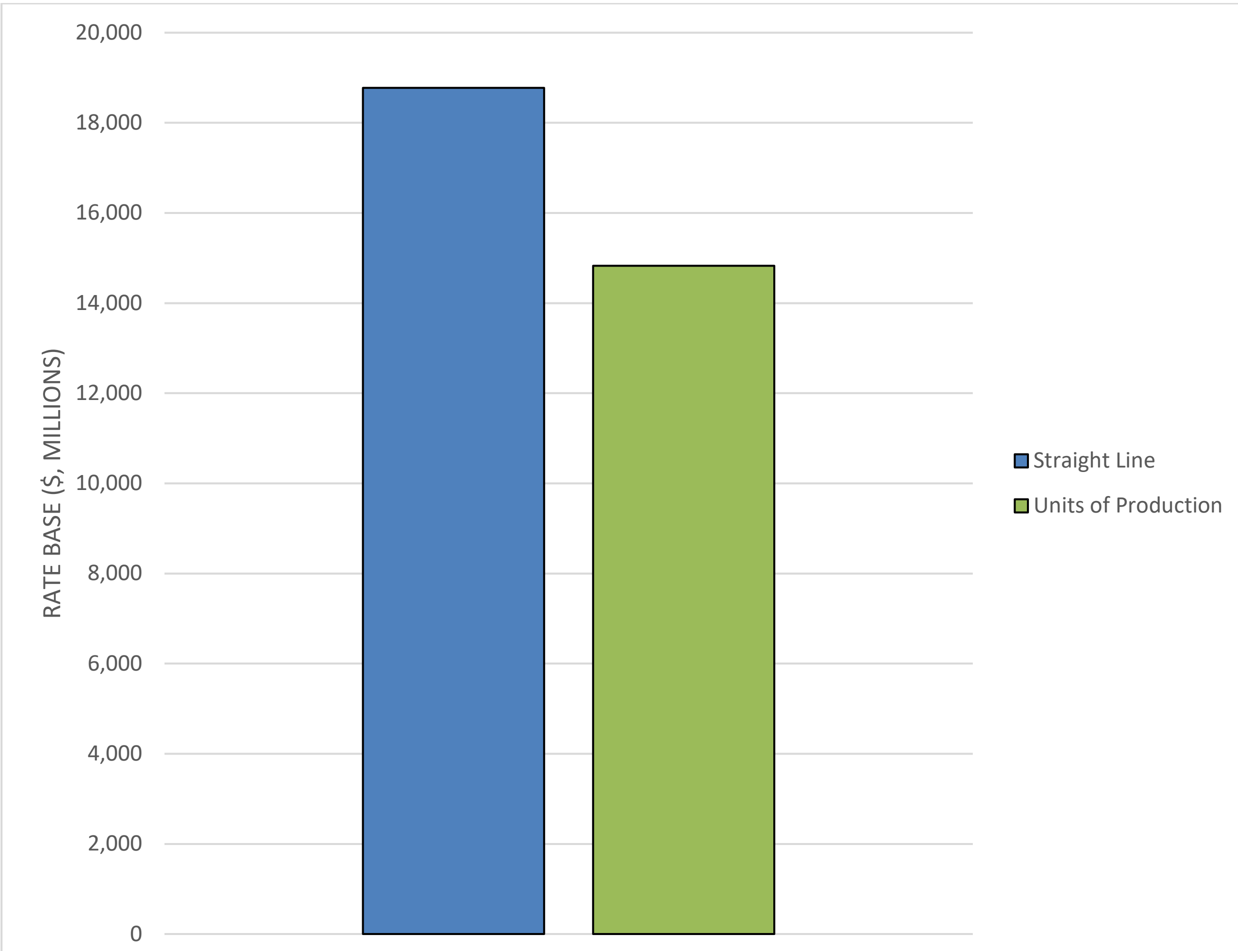


Figure 12b. Projected Rate Base As Of 2050
Medium Electrification - CEV (KEDNY)

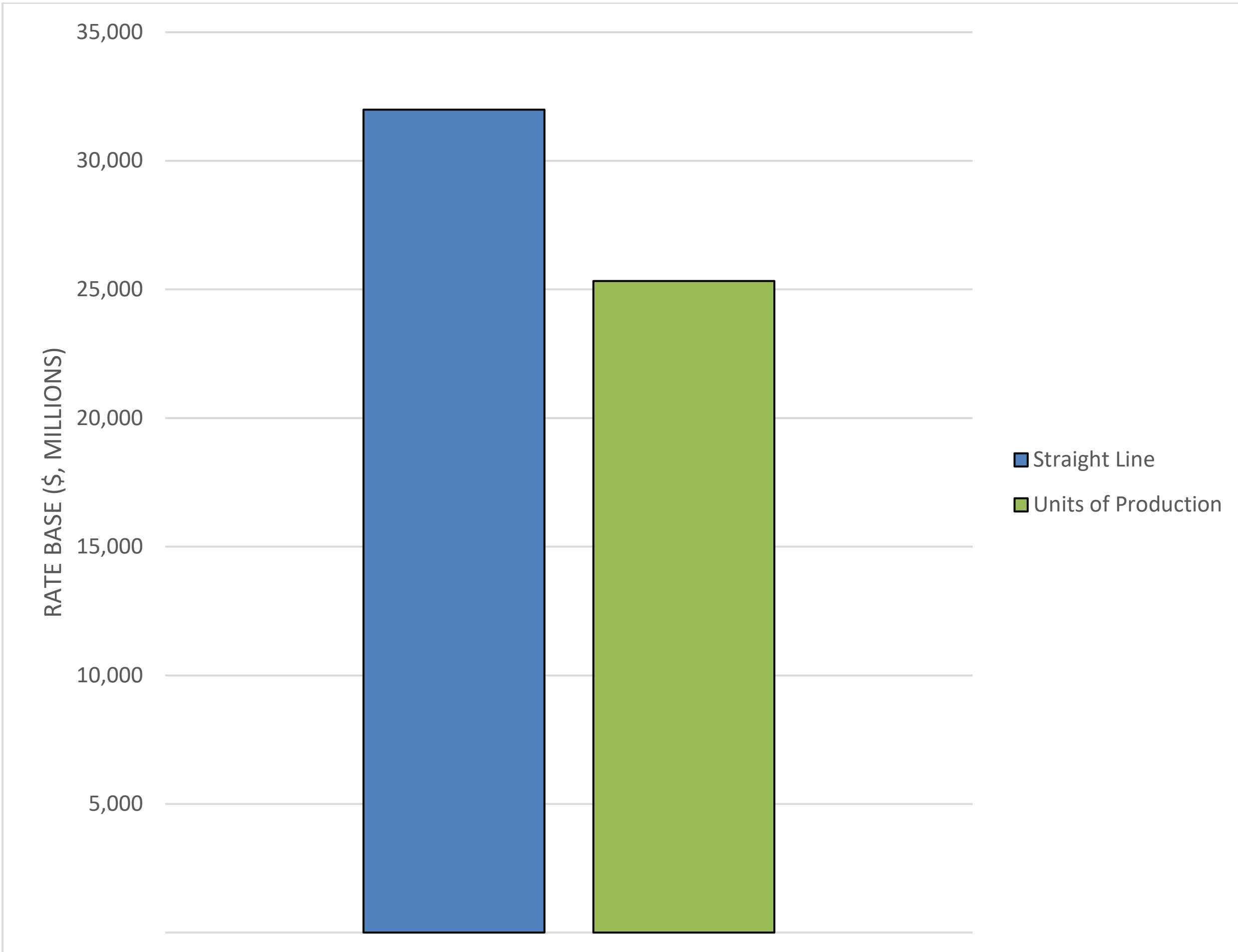
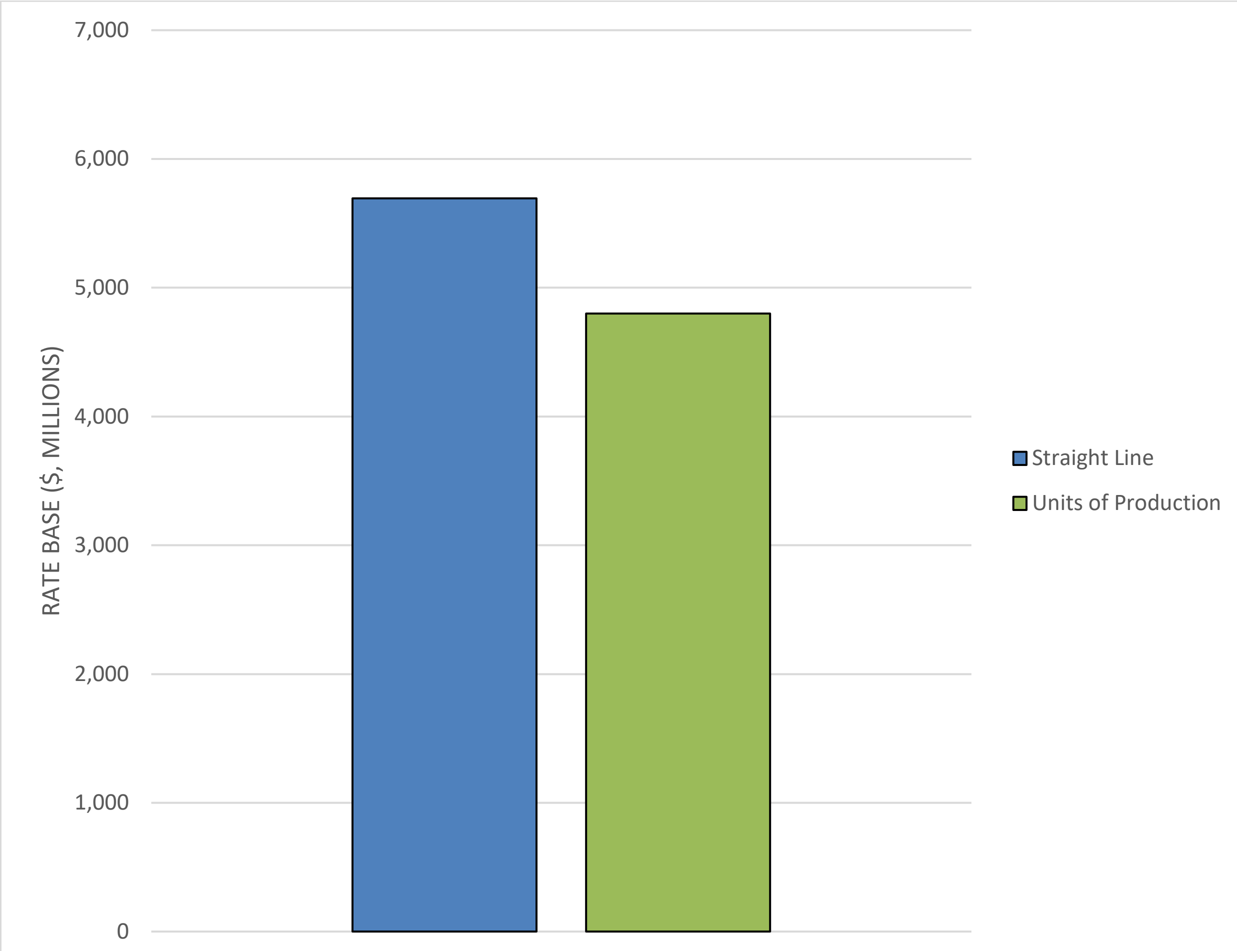


Figure 12c. Projected Rate Base As Of 2050
Medium Electrification - CEV (NMPC)



Comparison of Scenarios

As can be seen in the figures in the preceding sections, the overall results vary considerably depending on both the business assumptions and depreciation scenarios. Further, with declining throughput and customers, scenarios such as straight line with lower depreciation produce fairly significant bill increases in future years. However, over time for both the high electrification and medium electrification - CEV business assumption scenarios, the units of production depreciation approaches produce the most stable revenue requirement per customer over the full period of study. Additionally, the high electrification scenarios produce higher bill impacts for each depreciation scenario. The medium electrification – CEV scenarios, particularly when used with the units of production method, produce more stable bill impacts over time. This is illustrated further in Figures 13a, 13b, and 13c, which compare the baseline business as usual results to the units of production results for both the high electrification and medium electrification - CEV scenarios. As the figures show, the units of production scenario for medium electrification - CEV most closely approximates the business as usual revenue requirements on a per customer basis. As a result, when demand declines, of all the depreciation scenarios, the units of production method produces the most equitable results across the full period of study.

Figure 13a. Projected Revenue Requirement Per Customer
Business as Usual vs Units of Production (CEV and HE) (KEDLI)

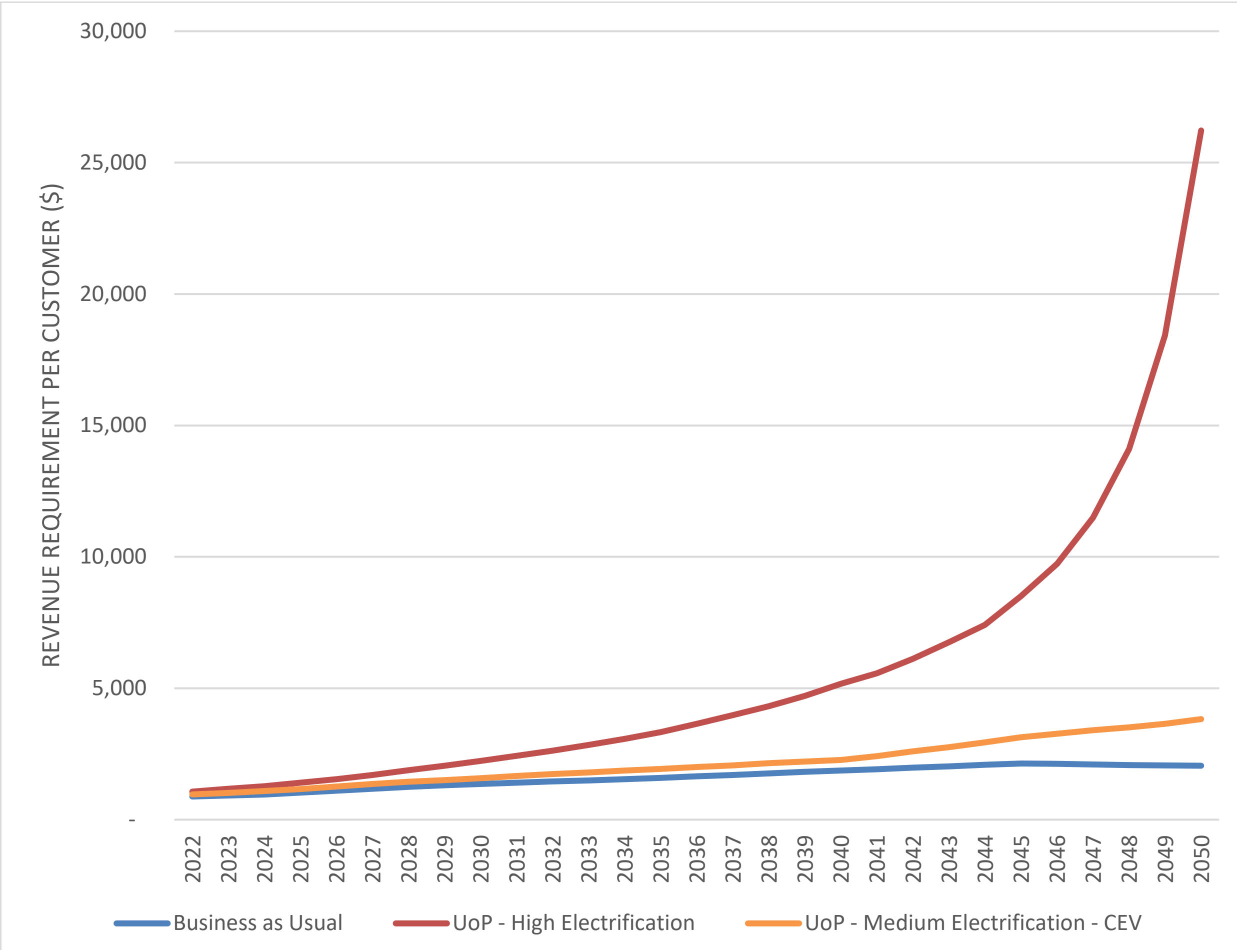


Figure 13b. Projected Revenue Requirement Per Customer Business as Usual vs Units of Production (CEV and HE) (KEDNY)

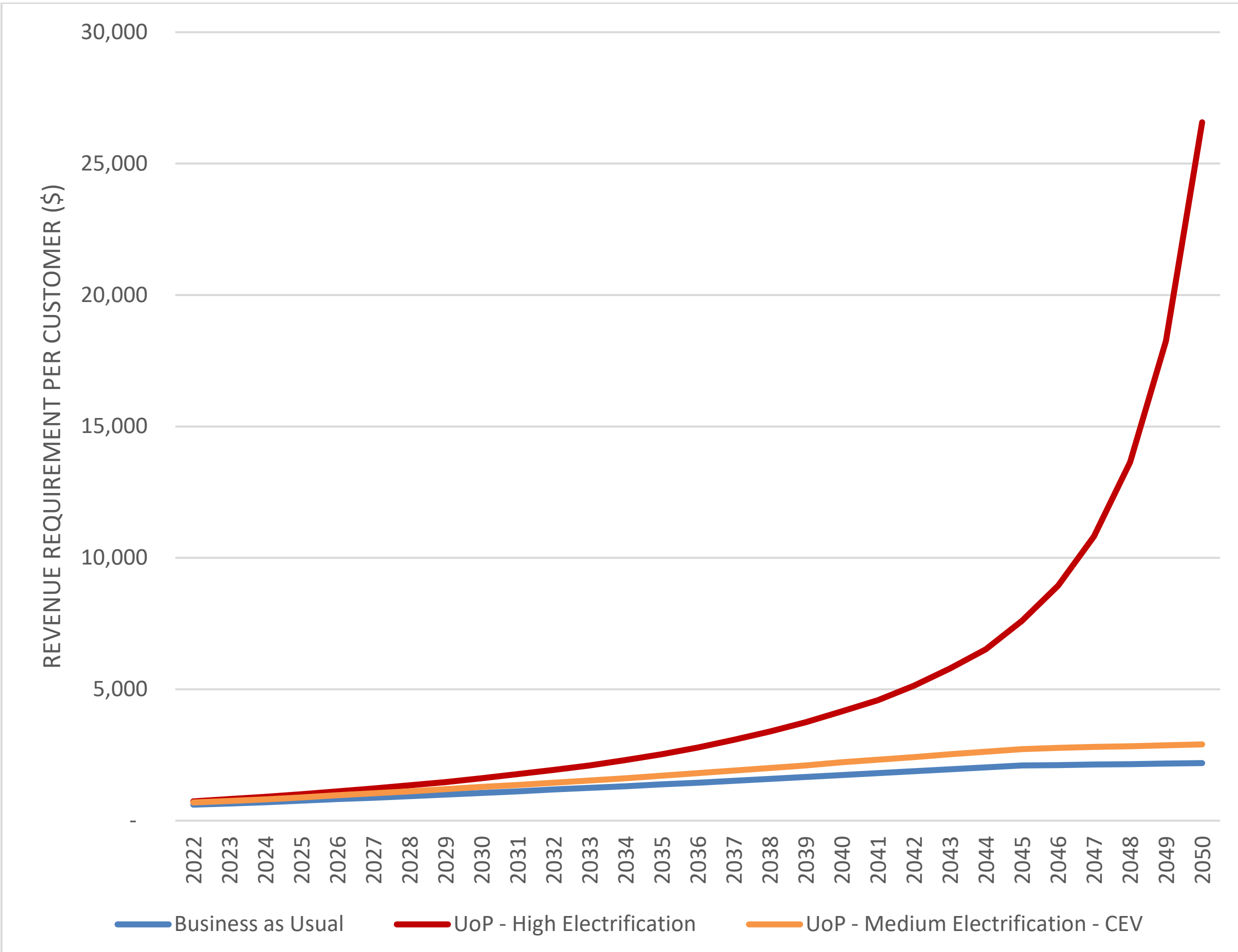
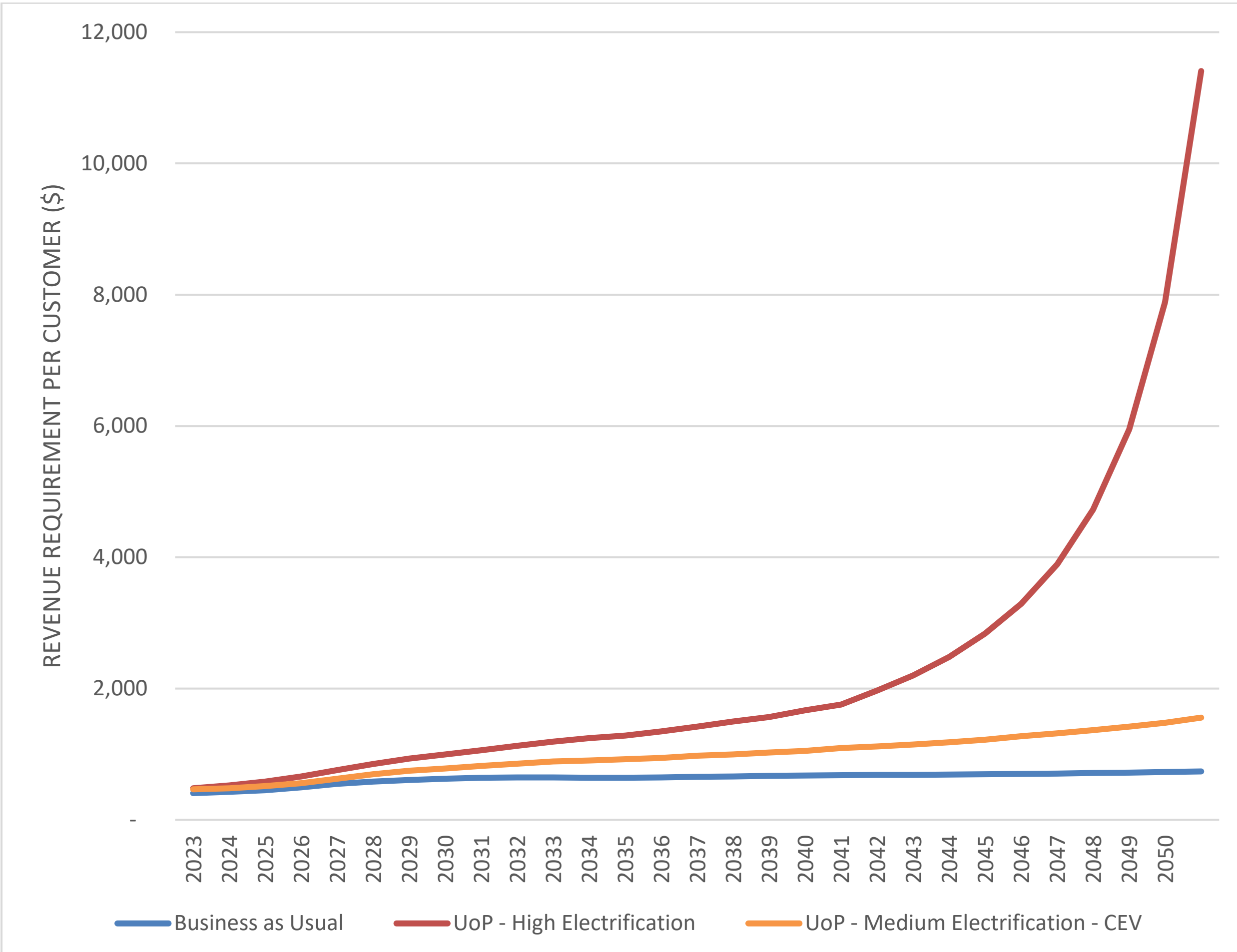


Figure 13c. Projected Revenue Requirement Per Customer
Business as Usual vs Units of Production (CEV and HE) (NMPC)



PART III. DEPRECIATION AND RATEMAKING CONCEPTS

PART III. DEPRECIATION AND RATEMAKING CONCEPTS

DEPRECIATION CONCEPTS

<u>Depreciation Definitions</u>

There are several prominent definitions of depreciation used in both accounting and regulatory contexts. The Federal Energy Regulatory Commission's ("FERC") gas Uniform System of Accounts, which the New York Commission has adopted, defines depreciation as:

> *Depreciation*, as applied to depreciable gas plant, means the loss in service value not restored by current maintenance, incurred in connection with the consumption or prospective retirement of gas plant in the course of service from causes which are known to be in current operation and against which the utility is not protected by insurance. Among the causes to be given consideration are wear and tear, decay, action of the elements, inadequacy, obsolescence, changes in the art, changes in demand and requirements of public authorities, and, in the case of natural gas companies, the exhaustion of natural resources. [20]

The Uniform System of Accounts further sets forth requirements for the method used for depreciation:

> *Method.* Utilities must use a method of depreciation that allocates in a systematic and rational manner the service value of depreciable property over the service life of the property.[21]

The National Association of Regulatory Utility Commissioners ("NARUC") uses essentially the same definition as the FERC:

> 'Depreciation,' as applied to depreciable utility plant, means the loss in service value not restored by current maintenance, incurred in connection with the consumption or prospective retirement of utility plant in the course of service from causes which are known to be in current operation and

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[20] 18 C.F.R § 201, Definition 12B. The electric definition is similar, although does not include the clause related to exhaustion of natural resources.

[21] This requirement is explicit in the electric Uniform System of Accounts and was added in FERC Docket No. RM99-7-000, a rulemaking proceeding that resulted in FERC Order No. 618. The same is not specifically stated in the gas Uniform System of Accounts but it there is no reason to doubt that the requirement of a systematic and rational allocation of capital costs would similarly apply to gas assets.

> against which the utility is not protected by insurance. Among the causes to be given consideration are wear and tear, decay, action of the elements, inadequacy, obsolescence, changes in the art, changes in demand, and requirements of public authorities.[22]

The U.S. Supreme Court has defined depreciation similarly:

> Broadly speaking, depreciation is the loss; not restored by current maintenance, which is due to all the factors causing the ultimate retirement of the property. These factors embrace wear and tear, decay, inadequacy and obsolescence. Annual depreciation is the loss which takes place in a year.[23]

The American Institute for Certified Public Accountants defines depreciation as follows:

> Depreciation accounting is a system of accounting which aims to distribute cost or other basic value of tangible capital assets, less salvage (if any), over the estimated useful life of the unit (which may be a group of assets) in a systematic and rational manner. It is a process of allocation, not of valuation. Depreciation for the year is the portion of the total charge under such a system that is allocated to the year. Although the allocation may properly take into account occurrences during the year, it is not intended to be a measurement of the effect of all such occurrences.[24]

Each definition incorporates similar important elements. Depreciation is a process of allocating capital costs to accounting periods. One purpose of this process of allocation is to match expenses to revenues for an enterprise. Given the importance of financial statements to investors, it follows that depreciation necessarily must be systematic and rational rather than arbitrary. There are additional important considerations for regulated entities, specifically natural monopolies subject to price regulation. Depreciation for regulated utilities is not merely an expense recorded to the income statement. Depreciation is also a direct component of the revenue requirement and impacts utility revenues as well. Additionally, it affects the rate base on which a utility earns a return as,

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[22] *See* page 13 of NARUC's *Public Utility Depreciation Practices*.
[23] *Lindheimer v. Illinois Bell Telephone Company*, 292 U.S. 151, 167 (1934).
[24] Accounting Research and Terminology Bulletin #1, AICPA, p.25.

more precisely, depreciation is a reduction to the rate base. Finally, from a regulatory standpoint depreciation is understood to be the return of investor capital and, as a result, appropriate levels of depreciation are necessary to attract the capital needed to provide safe, reliable, and affordable utility service.

Regulatory Considerations

Depreciation is of particular importance in the ratemaking process because it has a profound impact on both the return on capital and the return of capital. The latter is more commonly understood – depreciation expense is a component of the revenue requirement and directly affects current period utility rates. Rates are established with the intent that if a utility attains the approved revenue requirement it will result in the return of investor capital. Less appreciated is that depreciation also has a profound impact on the return on capital. First, accumulated depreciation is a reduction to rate base and so the total amount of capital allocated to depreciation expense over the life of the enterprise reduces the value of the company on which investors earn a return.[25] It follows that, over time, depreciation reduces the total amount required for the return on capital afforded to investors and reduces the total return on rate base paid by customers. Depreciation also has an additional impact. The risk of an investment in a company, and thus the overall rate of return, is a function – at least in part -- of how certain an investor is that his or her invested capital will be returned by the enterprise and, by extension, customers. Thus, if depreciation is established at a level in which there is significant doubt an investor will be afforded an opportunity for a return of his or her investment, then it follows that there is significant risk associated with the investment and, in turn, the rate of return should be higher to attract capital to the enterprise.

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[25] If depreciation rates are established properly, the decline in value should, at least in theory, be commensurate with the capital consumed to provide utility service.

The longstanding practice of using the prudent investment standard[26] for utility ratemaking means that there is an expectation that prudently invested capital will eventually be returned to investors and, since the assets being depreciated are already in rate base the prudency is not in dispute. Accordingly, depreciation is a matter of the timing of this recovery rather than a determination of whether costs should be included in rate base. Related to the timing of the recovery of costs is the concept of intergenerational equity, the principle that different generations of customers should pay their fair share of the costs of assets from which they receive service. It can be considered unfair and inequitable to have one generation pay a disproportionate share of these costs at the expense of another, and it is even more inequitable for one generation to pay for costs of assets that have been retired and no longer provide service.

Traditionally, under typical utility operations, the service provided by a utility system tends to be relatively constant over the service life of the underlying assets. For example, a pole supporting electric wires and other attachments provides similar output the year installed as in the year before its retirement. Accordingly, by far the predominant approach in the industry is to allocate costs in equal amounts to each period of the service life. This method, the straight line method, is currently used in the vast majority of instances for utility depreciation. The concept of intergenerational equity is, therefore, most commonly understood to mean an equal allocation of costs to each year of service. However, as is discussed in more detail in this report, there can be instances – and the FERC in its rulemaking has contemplated such instances in not strictly prescribing the

[26] The prudent investment standard contrasts with the fair value standard, which the Supreme Court had held to be the only constitutional standard until the 1940s. However, in the time since regulatory commissions have generally moved to use the prudent investment standard.

straight line method of depreciation[27] – in which the assumptions that underly the straight line method do not apply and alternatives may be more equitable.

In addition to intergenerational concerns discussed above, there are additional long-term depreciation impacts on both customer rates and earnings. Accumulated depreciation, which is effectively a running total of depreciation that has occurred in the past, is a reduction to rate base. As a result, while higher depreciation will have a short-term impact of increasing the revenue requirement in a given year, its longer-term impact will be to reduce rate base and, in turn, the return on rate base. Additionally, higher accumulated depreciation results in lower future depreciation accruals because there is less remaining cost to recover. As a result of these combined factors, in the long-term – all else equal – higher annual depreciation expense actually results in lower customer rates and lower total utility earnings (because revenues are established with the objective that earnings will be equal to the product of the rate of return and the rate base, a lower rate base means lower earnings). The converse is also true. All else equal, lower annual depreciation expense will have a short-term effect of reducing the revenue requirement but over the long-term will result in a higher rate base and a higher return on rate base. Thus, when considering the impact on customers due to depreciation, there are both short- and long-term impacts to consider and often these impacts move in the opposite direction from one another.

NARUC explains this concept well:

> The regulatory body prescribing depreciation rates is thus confronted with a decision which affects both short-run and long-run interests of the customer and the company. If a commission prescribes rates which yield depreciation accruals that are too low, the revenue requirement in the short run may be lower. But the requirements for income taxes and return may offset the apparent savings in depreciation expense, so service rates in the long run may be higher. If depreciation rates are set so low that the revenue

[27]FERC Docket No. RM99-7-000, Order No. 618, pp. 8-10.

> requirement fails to repay the capital invested in a group of property by the end of its service life, confiscation takes place or the unpaid cost remains in the rate base until amortized or expensed. On the other hand, if the regulatory body establishes depreciation rates toward the upper end of the zone of reasonableness, rates for service will be higher in the short-run, but may be lower in the long-run.[28]

Indeed, the last sentence in this passage is perhaps too equivocal. In numerous depreciation studies and related ratemaking proceedings over several decades, Gannett Fleming has modeled and analyzed comparisons of depreciation methods and proposals (including for this study). Generally, it is true that when comparing two depreciation approaches, the one with higher annual depreciation expense results in lower customer rates in the long run than the approach that results in lower annual depreciation expense in the short-term. Further, as our analysis for this report shows, if sales or the number of customers decline significantly, the impacts are far more pronounced and lower depreciation today will have a much more disproportionate impact on future customers.

DEPRECIATION CONSIDERATIONS

<u>Service Lives of Utility Assets</u>

Definition of Service Life

The definitions of depreciation in the previous section establish that depreciation must be determined using a method that results in the systematic and rational recovery of capital over the service life of the assets. The method must be systematic and rational and so cannot be arbitrary, but it must also occur over the service life – not, as a general matter, before the asset is in service or after it is retired. These requirements are consistent with the concept of matching revenues with expenses. A systematic and rational allocation of a capital asset that occurs during the period of time in which the

[28] NARUC Public Utility Depreciation Practices, pp. 23.

asset provides service provides a proper representation of an entity's operations, whereas an arbitrary allocation or one that occurs over a different period can provide an inaccurate and misleading view of a company.

Because the method of depreciation is to be systematic and rational over the service life, determining whether a method meets this objective first requires understanding the concept of service life. The definition of service life is relatively straight forward. For example, the electric Uniform System of Accounts defines service life as follows (the gas definition is substantially similar):

> *Service life,* means the time between the date electric plant is includible in electric plant in service, or electric plant leased to others, and the date of its retirement.[29]

This definition does not specify that the retirement that concludes an asset's service life must be due to any specific factor. Further, it does not, for example, preclude factors such as obsolescence, requirements of public authorities or even management discretion. It follows then that the method used for depreciation must result in the recovery of costs by the time of retirement and, since the Uniform System of Accounts enumerates several causes to be considered – including obsolescence and the requirements of public authorities – any of these causes can define or redefine the service life of a particular asset. Thus, no matter the reason for retirement,[30] the depreciation rates established by a regulatory commission should, as a general matter, be designed such that capital costs are recovered before the assets cease to provide utility service.

Of course, reality is complicated and depreciation is based on forecasts of the future. As a result, there have been instances in which assets have been retired earlier

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[29] Uniform System of Accounts, Definition 36.
[30] Certain exceptions may be made for extraordinary or unusual causes of retirement; however, the Uniform System of Definitions make clear that obsolescence due to factors such as the CLCPA do not fall into the category of exceptions to this general rule.

than was anticipated in the depreciation rates established over the life of such assets. Recent examples abound, for example, retirements of fossil electric generating stations and wholesale replacements of electric meters with newer metering technology. However, the prudent investment theory of ratemaking has evolved to mean that investors generally expect that, even if depreciation rates undershoot the mark – and assets are retired before being fully depreciated – then a utility will at a minimum be afforded the opportunity for a return of the undepreciated capital costs. Thus, there are numerous examples of utilities being provided the recovery of undepreciated capital costs in the event an asset or group of assets have retired early.

With these concepts in mind, it is important to further consider which factors can reasonably result in the conclusion of an assets service life. The "useful life" or "service life" is not merely the attainable life from a physical standpoint, which is a common misconception. Rather, the conclusion of the service life of an asset results from its retirement, which may occur due to any number of – or combination of – factors. If an asset is placed in service in 1980 and retires in 2020, its service life is 40 years no matter whether the retirement is due to decay, damage, the need for additional capacity, obsolescence, or due to the actions of public authorities such as environmental regulations or requirements that result in retirement.

That the service life is not merely defined by an asset's physical life is clear from the Uniform System of Account's definition of depreciation, which states that "[a]mong the causes to be given consideration are wear and tear, decay, action of the elements, inadequacy, obsolescence, changes in the art, changes in demand and requirements of public authorities."[31] NARUC explains further that factors such as obsolescence, technological change and changes in demand should be considered:

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[31] Uniform System of Accounts, Definition 36.

> Obsolescence may bring about retirements by rendering plant uneconomical, inefficient, or otherwise unfit for service because of improvements in technology or because of changes in function. Equipment manufacturers may contribute to obsolescence by discontinuing production of replacement parts or de-emphasizing maintenance, software or other kinds of support for older equipment.
>
> Technological advances have increased the frequency in which obsolescence causes the retirement of utility plant. Computers, the electronic chip, remote controlled operation and supervision of power distribution stations and natural gas regulating equipment, remote meter reading, fiber optic cable, as well as interest in nonutility power production and demand-side management are technological developments that have impacted utility operations.
>
> Changes in demand reflect changing customer preferences requiring the replacement of plant which no longer permits the utility to fulfill its obligation to provide service. An example is the replacement of electric kilowatt hour meters with meters that also record usage by time of day.[32]

Thus, the combined definitions, instructions and guidance from sources such as the Uniform System of Accounts and NARUC mean that depreciation should be designed to recover the costs of an asset in a systematic and rational manner by the time the asset is removed from service, regardless of the reason the asset is retired. It follows, therefore, that the CLCPA should be considered when establishing service lives for gas assets.

Net Salvage

Net salvage is the cost to retire an asset, as well as any residual value of the asset, at the end of its service life. The Uniform System of Accounts defines net salvage as follows:

> *Net salvage value* means the salvage value of property retired less the cost of removal."[33]

[32] NARUC Public Utility Depreciation Practices, pp. 127-128.
[33] Uniform System of Accounts, definition 19.

Net salvage is described as "positive net salvage" if the gross salvage value exceeds removal costs and described as "negative net salvage" (i.e., a net cost) if removal costs exceed the gross salvage value. It is common in utility operation for the cost of removal (also referred to as "cost of retirement") to exceed any gross salvage value at the end of an asset's life. Thus, net salvage is often a negative amount.

The Uniform System of Accounts requires that the service value of an asset be allocated in a systematic and rational manner over the asset's service life. Service value is defined "the difference between original cost and net salvage value of electric plant."[34] Thus, the expected net salvage should be included in depreciation in addition to the original cost of an asset. The inclusion of net salvage matches the full cost of an asset (including net salvage) with its use and, from an equity standpoint, results in customers paying for the full cost of assets from which they receive service. This concept is described by NARUC:

> Under presently accepted concepts, the amount of depreciation to be accrued over the life of an asset is its original cost less net salvage. Net salvage is the difference between the gross salvage that will be realized when the asset is disposed of and the cost of retiring it. Positive net salvage occurs when gross salvage exceeds cost of retirement, and negative net salvage occurs when cost of retirement exceeds gross salvage. Net salvage is expressed as a percentage of plant retired by dividing the dollars of net salvage by the dollars of original cost of plant retired. The goal of accounting for net salvage is to allocate the net cost of an asset to accounting periods, making due allowance for the net salvage, positive or negative, that will be obtained when the asset is retired. This concept carries with it the premise that property ownership includes the responsibility for the property's ultimate abandonment or removal. Hence, if current users benefit from its use, they should pay their pro rata share of the costs involved in the abandonment or removal of the property and also receive their pro rata share of the benefits of the proceeds realized.[35]

[34] Uniform System of Accounts, definition 37.
[35] *Public Utility Depreciation Practices*, NARUC, 1996, p. 18.

"Pro rata" in the passage above means proportional or equal shares. Thus, by far the predominant approach in the industry for net salvage is to use the straight line method to allocate net salvage costs to each year of service, which is also used for the original cost of assets. This approach is used in the vast majority of regulatory commissions, including New York. There are a handful of jurisdictions that either recover net salvage costs when (or after) they are incurred or use a deferred method of the recovery of net salvage. However, as net salvage costs have increased over time both of these alternative methods have caused issues for several utilities, including significant increases in depreciation when recorded costs increase or negative accumulated depreciation balances for net salvage.

Methods of Depreciation

The previous sections describe depreciation in general as well as the process for estimating service lives and net salvage. In addition to the determination of these depreciation parameters, a depreciation system must be defined in order to calculate depreciation rates and expense. A depreciation system is generally defined by a concept, a method, a procedure and technique. This report has previously discussed that depreciation, from both an accounting and ratemaking standpoint, is based on a cost allocation concept (rather than, for example, a valuation concept). With the concept established, a depreciation system can then be defined with the selection of the appropriate method, procedure and technique.

Straight Line, Accelerated and Deferred Methods

The term depreciation method refers to the method by which costs are allocated to each period for which an asset renders service. There are three general categories of depreciation methods: straight line, deferred (also referred to as "decelerated") and accelerated. For the straight line method, costs are allocated ratably, or in equal amounts, to each period that the asset is in service. For a deferred method, fewer costs are allocated to earlier periods and more to later periods. For an accelerated method, more is allocated to early periods than to later periods. As with the cost allocation concept discussed previously, the straight line method is currently used almost universally for accounting and ratemaking and is supported by depreciation textbooks and precedent in most regulatory jurisdictions.

The use of the straight line method also requires a determination of the units of measure used to allocate costs. In most circumstances, costs are allocated to fixed accounting periods (i.e., an accounting year). Thus, the unit of measure is most commonly based on time and the straight line method is typically used to allocate equal amounts of the costs of an asset to each accounting year.

Units of Production Method

There are circumstances in which allocating an equal amount of costs to each year of service may not provide the most equitable capital recovery. For example, a natural gas production field may produce a limited amount of gas in the early years as the field is developed. Production then accelerates to full production and eventually slows as the supply is exhausted. In these types of circumstances, the <u>units of production</u> method, which allocates capital costs equally to each unit of production rather than in equal amounts to each year, may be appropriate. The same concept can apply if consumption, rather than production, were to vary significantly over the life of an asset. Thus, when the units of production method is used, depreciation accruals may vary over an asset's life based on the production or consumption that occurs each year. Thus, for the example of a natural gas production field, depreciation would initially be lower, would rise as production increases and then would slow as production eventually declines. In certain circumstances, this approach provides a better match of depreciation expense to revenues and, similarly, may be more equitable if production or consumption are expected to vary over the lives of an asset or assets.

The units of production method is similar to the straight line method, only that costs are allocated equally in proportion to production rather than in equal amounts each year. Indeed, the straight line method based on time is mathematically equivalent to the units of production method if production were equal in each year of service. The units of production method has been used for gas and oil production facilities, for certain railroad assets, mining industry assets, and, as will be discussed later in this report, has been proposed by at least one utility to address the impact of climate legislation on the natural gas industry.

PART IV. CONCLUSION

PART IV. CONCLUSION

CONCLUSION

The electric and gas industries in New York have invested significant capital to provide safe, reliable, and affordable energy to New York customers and citizens. The CLCPA will have a profound impact on both industries and will result in transformative change and will require significant investments to smoothly transition to a decarbonized energy system. The ability of utilities to raise the capital needed to make these investments will depend in part on being able to recover capital investments made to provide safe and reliable service. Further, equity requires that costs be paid by customers who receive service from gas and electric utilities and that these costs not be deferred to future generations of remaining customers. It is, therefore, critically important to begin to recognize the need for higher depreciation expense sooner rather than later. The New York Commission has recognized the potential for widespread electrification and it should recognize the importance of establishing appropriate depreciation rates that can be accepted while balancing the interests of current customers, future customers, and investors. Assuming a decline in gas demand, the more depreciation recovered today means smaller balances that will need to be recovered from customers in the future.

This report has focused on depreciation and its effect on the revenue requirement, which from an equity standpoint is concerned with different generations of customers. However, the challenge of a potentially shrinking industry, under state and local law that may make significant portions of gas systems obsolete, means that the temporal allocation of costs is only part of the picture. The New York Commission, and perhaps the legislature, must also consider who should pay. Perhaps customers who electrify could instead pay for their share of the costs of the gas system from which they received a benefit, in some cases for many years, but now which will not provide service for as long as expected. The Commission and legislature could also determine how to meet CLCPA goals through fees for emissions or some other mechanism. A share of the energy transition could also be paid by federal or state taxpayers as an investment in an overall cleaner energy economy in the nation and state.

As we have worked on this issue across the country, we have discussed the future state of the electric and gas industries with numerous thoughtful, intelligent experts. There is not a current consensus on what the precise path forward will be, nor could there be given the uncertainty of what will unfold over the next three decades. However, the depreciation scenarios in this report provide a useful indication of the potential cost impact. In addition, the longer the New York Commission waits to address these impacts, the more expensive they will become (as addressed further in the Appendix). The utilities in the state are putting considerable thought into the issue and, at least thus far, their proposals in rate cases – while reasonable given the information available at this time – are quite moderate compared to the potential full impacts of the CLCPA.

In a scenario such as the high electrification business scenario, the analysis in this report shows that action will be necessary to mitigate intergenerational inequity and to make sure that going forward each generation of customers pay their fair share. The analysis also shows that the medium electrification - CEV scenario produces less significant bill impacts than the high electrification scenario. This is true for all depreciation approaches. Thus, there are two primary conclusions to draw from the analyses in this report. The first is that higher depreciation in the near-term produces lower customer bills in the future when compared with an approach that produces lower depreciation in the near-term. The second is that the future state of the industry – the set of business assumptions regarding future customer counts and gas throughput – has a significant impact on the resulting customer bills.

Our analysis suggests that the New York Commission, and other commissions facing similar issues, should establish depreciation rates at the upper end of the range of reasonableness, while still balancing the rate impact on current customers. This is the least costly policy in normal times, but its importance is even more pronounced in times of change. Supporting too low levels of depreciation adds considerable risk to future customers as well as investors and further risks that companies will not have access to the capital needed to fund the energy transition envisioned by the state. There are at least two aspects that need to be understood and estimated to determine the most appropriate depreciation approach: (1) a reasonable estimate of the future state of the gas business; and (2) a depreciation approach that best aligns with this vision of the future. Both the business assumptions and depreciation approaches have an impact on current and future customer bills and, therefore, both are needed to determine the most equitable approach to the recovery of capital and to meet the state's goals set forth in the CLCPA in the most equitable manner possible. However, these considerations should be balanced with the cost of delaying necessary increases in depreciation. If the future state of the industry can be reasonably expected to require higher depreciation than a business as usual state, then it will be less costly to customers to increase depreciation today even if the precise future state is uncertain.

APPENDIX

NATIONAL GRID'S CLEAN ENERGY VISION

In April 2022, National Grid announced its Clean Energy Vision ("CEV"),[36] a plan to decrease reliance on fossil fuels from its U.S. gas and electric systems, enabling the homes and businesses they serve to meet their energy needs without the use of fossil fuels by 2050. The plan rests on four pillars: (1) aggressively accelerating insulation and energy efficiency improvements to buildings; (2) supporting cost-effective, targeted electrification on the gas network, including networked geothermal solutions, to electrify as much as 50% of the heating load by 2050; (3) in areas where full electrification may not be practical or cost-effective, providing customers with the tools to pair electric heat pumps with their gas appliances; and (4) finally, eliminating fossil fuels from the existing gas network no later than 2050 by delivering renewable natural gas (RNG)[37] and clean hydrogen[38] to customers.

Under its CEV plan, National Grid expects to source carbon-neutral biomethane from across the Eastern United States, and to leverage zero-carbon hydrogen in a blend of up to 20 percent of gas volumes delivered across the network, together with dedicated service of 100 percent hydrogen to larger commercial, industrial, transportation and generation customers. The plan reduces delivered gas demand by more than half, compared to today's levels, through demand-side strategies including the departure of approximately one quarter of current gas customers across the state.

Applying 20-year Global Warming Potential ("GWP") values and other assumptions based on New York State's emissions guidance to date, National Grid estimates that its plan

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[36] https://www.nationalgrid.com/us/fossilfree

[37] RNG is pipeline-quality biomethane produced from biomass or biogas. Biogas is a renewable energy; it is created as a direct result of transforming organic waste using anaerobic digestion.

[38] Hydrogen, the most abundant chemical element on earth, offers enormous potential as a source of clean energy. When hydrogen is produced with carbon free feedstocks it is known as clean hydrogen and is carbon free.

reduces emissions by more than 85 percent on a gross emissions accounting basis, exceeding the overall economy-wide limit required in the CLCPA. On a net emissions accounting basis, National Grid indicates that its plan achieves net zero GHG emissions by 2050.

Per New York Commission requirement, National Grid will be filing a study further detailing how its gas distribution companies plan to achieve compliance with the CLCPA in early 2023.

NATIONAL GRID LONG-TERM FORECASTS

National Grid's revenue requirement modeling incorporates forecasts of capital expenditures, gas throughput and customer counts that have been developed for the Company for each set of business assumptions. Due to the challenges in forecasting other revenue requirement components (such as O&M and taxes) over the next thirty years to a similar level of detail, National Grid's revenue requirement modeling for this report does not incorporate these additional revenue requirement items. Instead, the revenue requirement and bill impacts are based on the aspects of the revenue requirement directly impacted by depreciation approaches -- depreciation expense and rate base.[39]

A more detailed explanation of the forecasts of capital expenditures, gas throughput and customer counts are provided in the next sections.

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[39] Gannett Fleming has performed similar revenue requirement modeling for utilities that do incorporate forecasts of future operations and maintenance and taxes. Generally, the conclusions derived from modeling that includes these inputs is not materially different from those resulting from this report for National Grid.

Gas Customer Counts and Throughput

The business as usual scenario is based on the “Adjusted Baseline Forecast – S05” forecast (*a.k.a* , the Company's annual gas load forecast). This incorporates business as usual impacts of Demand-Side Management (“DSM”) programs (energy efficiency, electrification of heat, demand response) and enacted local laws that will impact gas usage. The DSM impact is based on short-term Company targets from New York and New England until 2025. Subsequent to 2025, annual DSM impacts continue at similar rates. In downstate New York, the impact of Local Law 97 and Local Law 154 are also incorporated into this scenario.

The high electrification scenario (“S25”) was constructed using assumptions to meet the specific parameters of the Gas Planning Order, namely, that 50 percent of gas customers leave the gas system by 2040 and 10 percent remain in 2050 (compared to 2021 levels). It assumes the same short-term DSM savings as S05, and then reduces customer count over time to achieve a 90% meter reduction from full electrification. The largest customer count reductions are applied to classes that may be comparatively more likely to electrify (residential non-heat and residential heat). Deep energy efficiency savings of 25 percent to 30 percent are applied to all customers who remain using gas in 2050.[40]

The medium electrification - CEV scenario relies on the use of deep energy efficiency, hybrid gas and electric (dual-fuel) heating, and full electrification of approximately 25 percent of gas customers, to achieve gas demand reductions of 55 percent by 2050. All customers who continue to require gas by 2050 are served by 100 percent fossil-free gas supply, including a blend of renewable natural gas and clean

[40] Future throughput in the high-electrification case is based largely on continued use of gas by commercial and industrial customers who cannot readily electrify. Given that a relatively small number of customers comprise the largest uses of gas, this throughput is sensitive to assumptions.

hydrogen delivered to most customers, with a 100 percent hydrogen fuel supplied to all other customers in 2050. This scenario is based on National Grid's April 2022 Clean Energy Vision and reflects specific parameters subsequently developed for KEDNY, KEDLI and NMPC. This scenario will be fully described and evaluated in forthcoming CLCPA studies to be filed by National Grid by March 31, 2023.

The projected customer counts and gas throughput levels for each of these three business assumption scenarios are set forth in the figures below. Each of the three scenarios forecast different levels of growth or decline in customers and gas throughput. As discussed in more detail in Part II of this report, the differences in these inputs have an impact on the revenue requirement over the next three decades.

Figure A-1a. Projected Customer Counts, 2021-2050 (KEDLI)

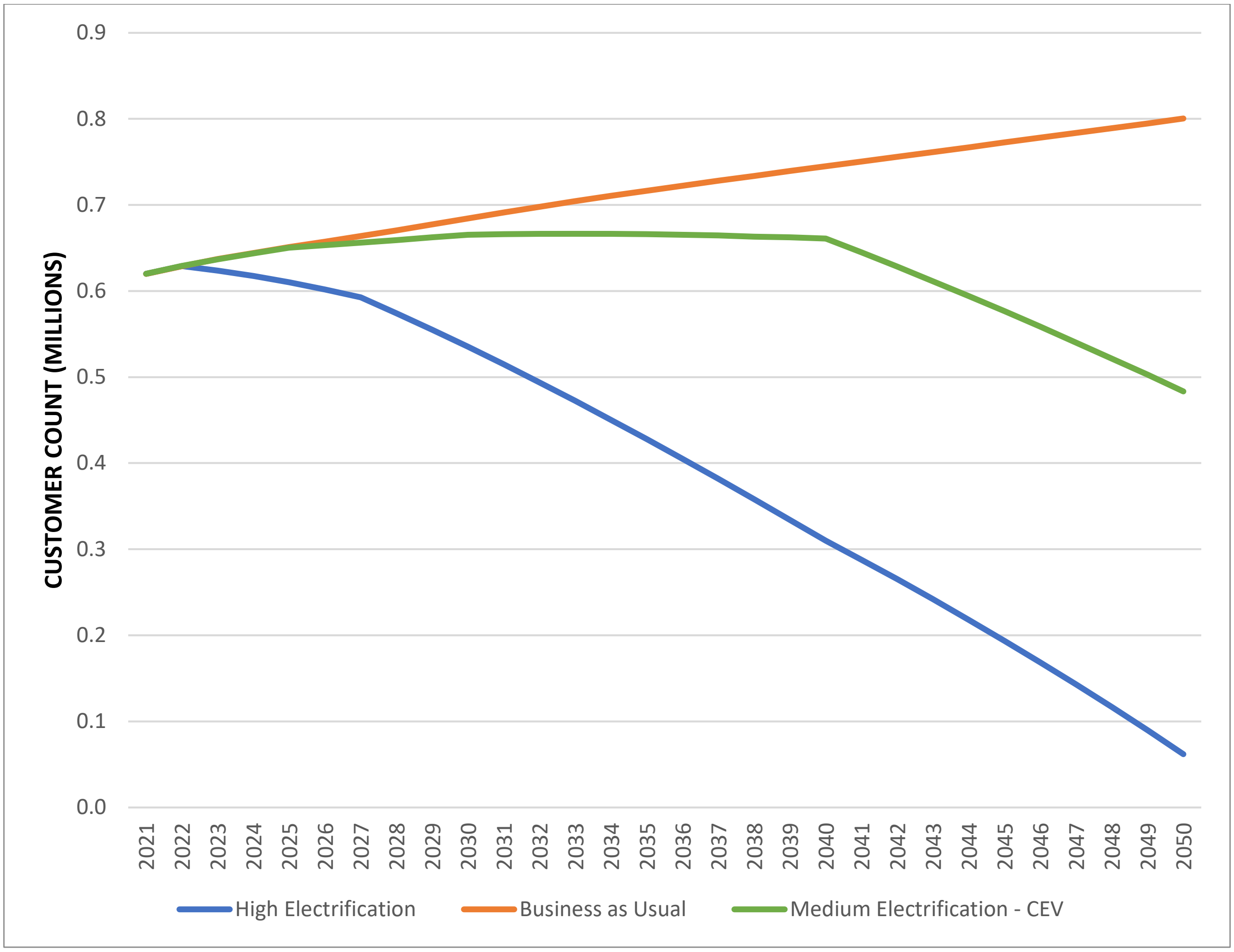


Figure A-1b. Projected Customer Counts, 2021-2050 (KEDNY)

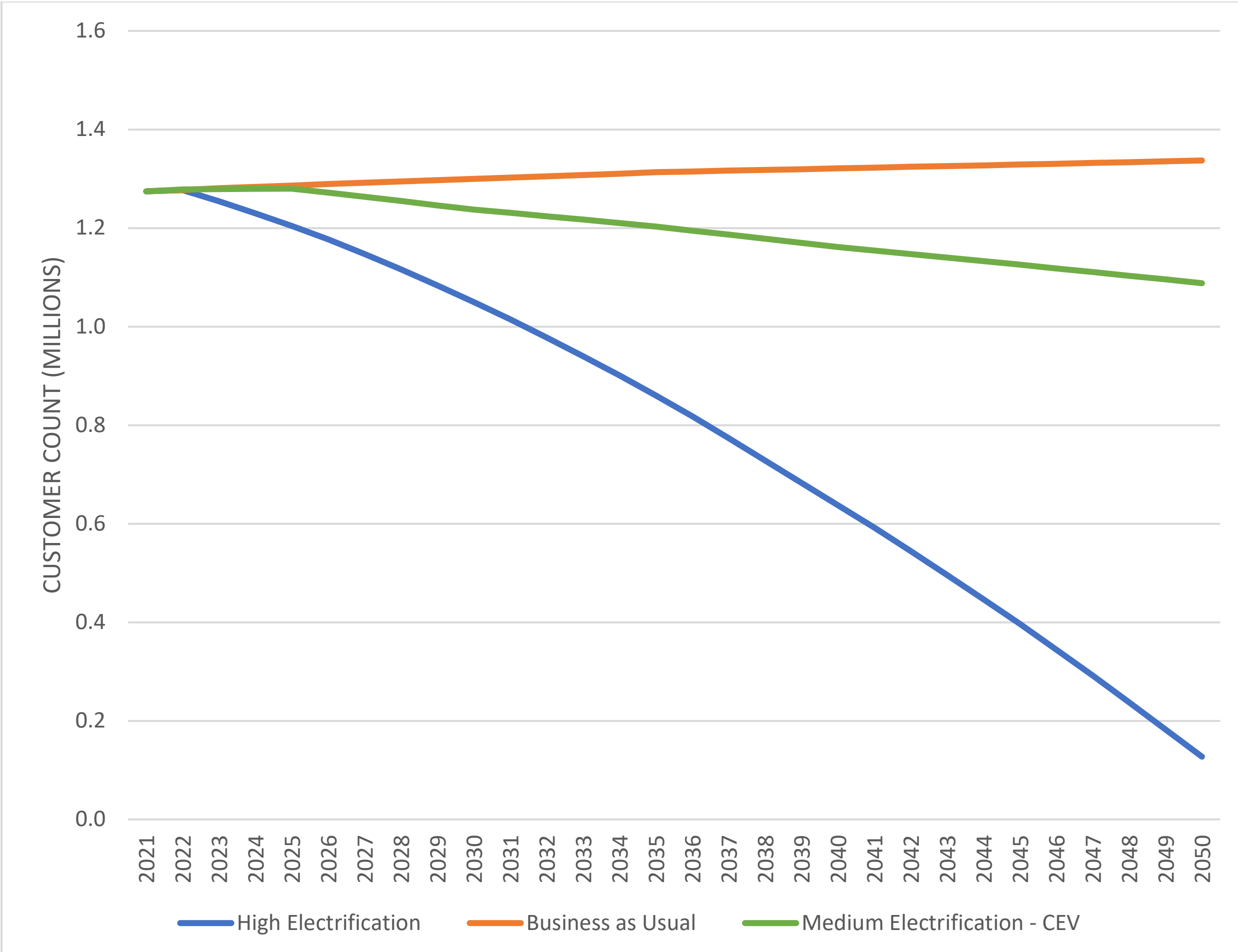


Figure A-1c. Projected Customer Counts, 2021-2050 (NMPC)

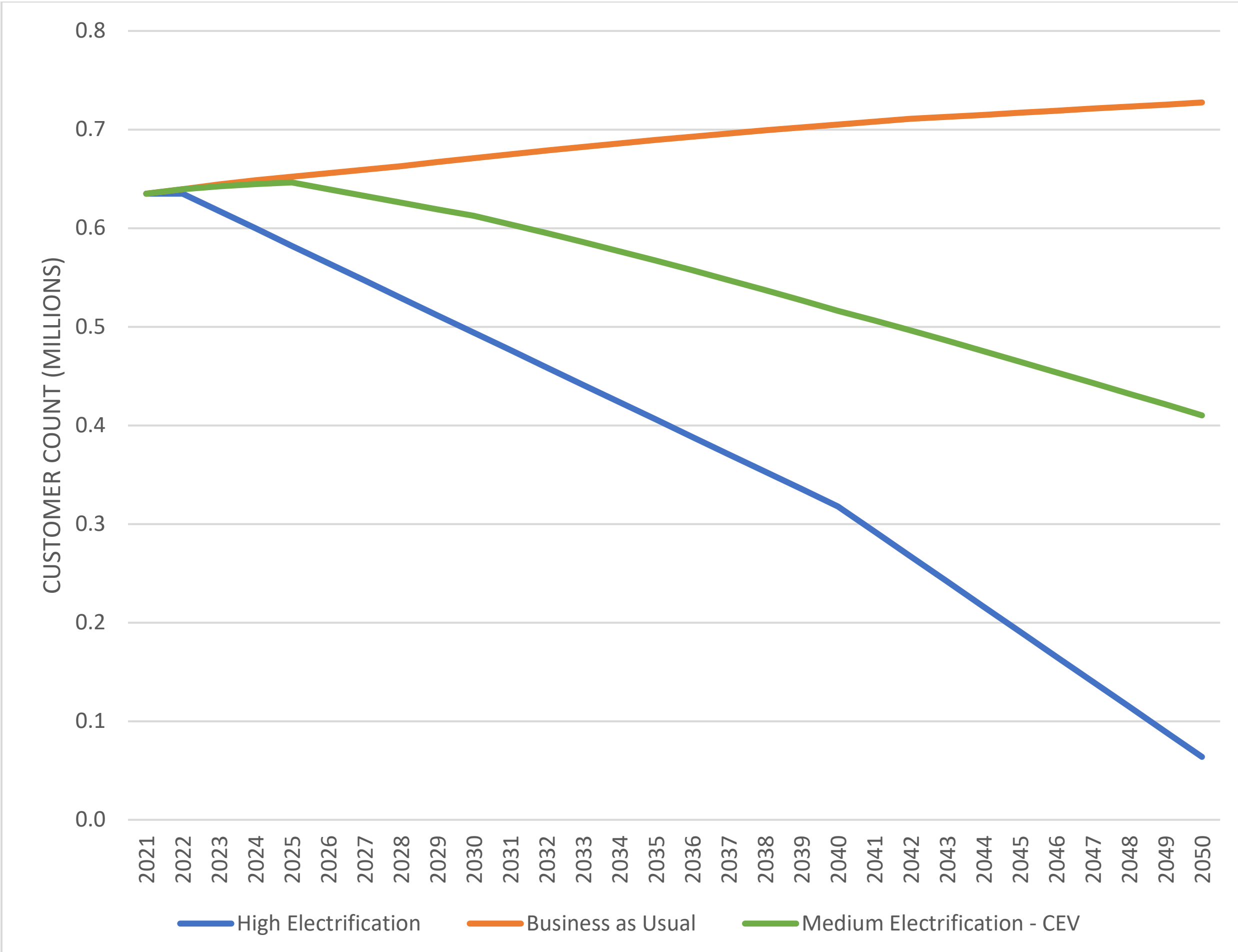


Figure A-2a. Projected Gas Throughput, 2021-2050 (KEDLI)

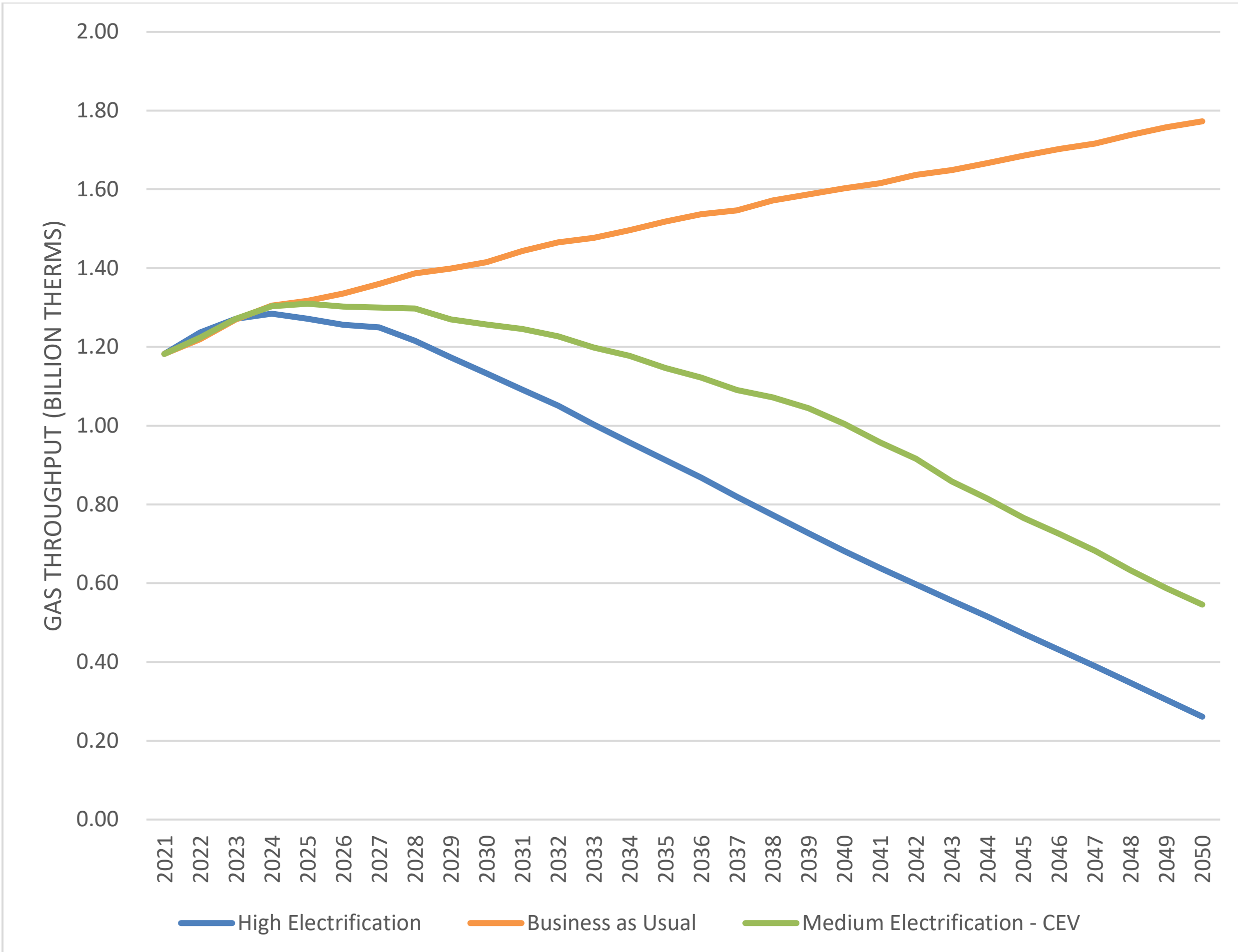


Figure A-2b. Projected Gas Throughput, 2021-2050 (KEDNY)

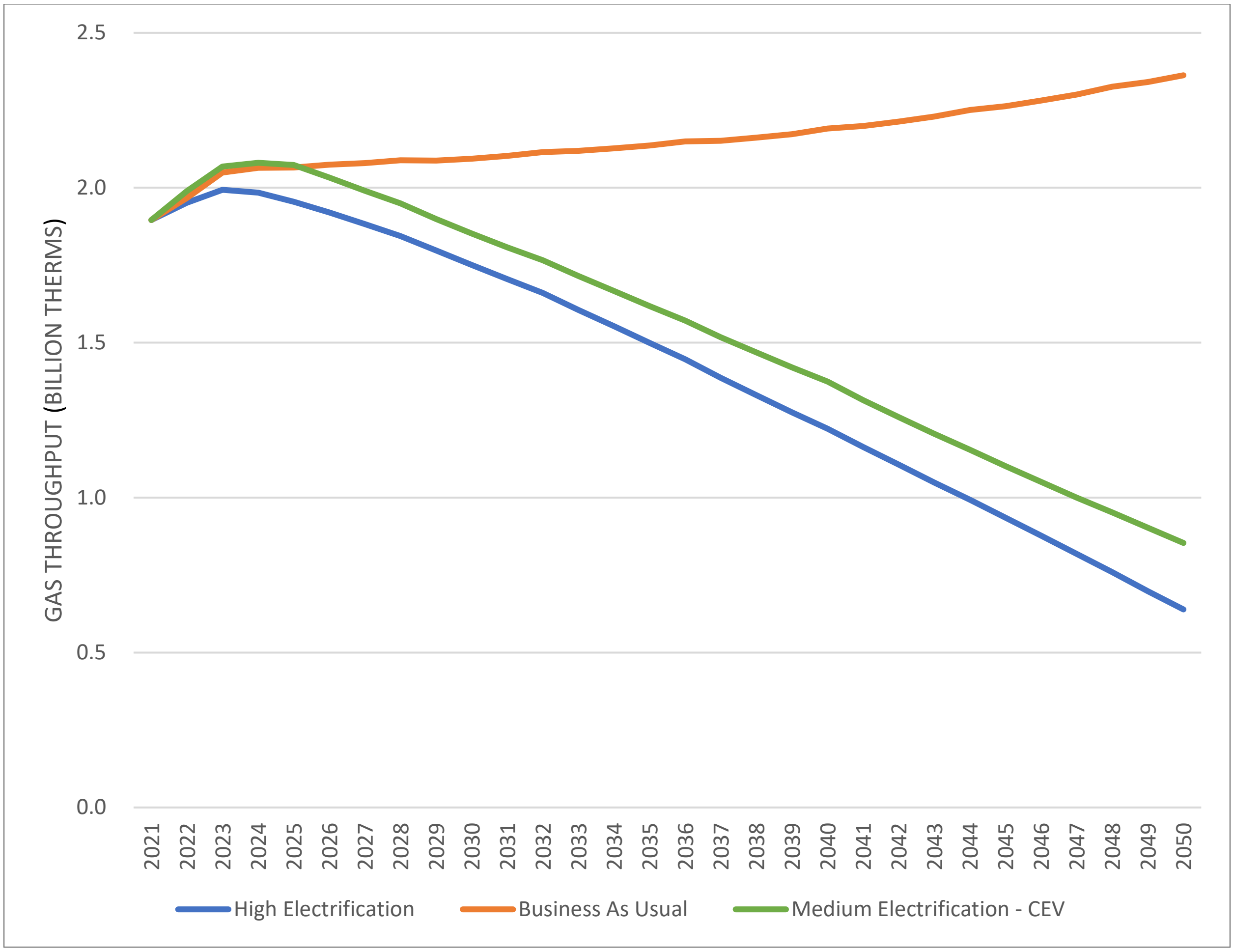
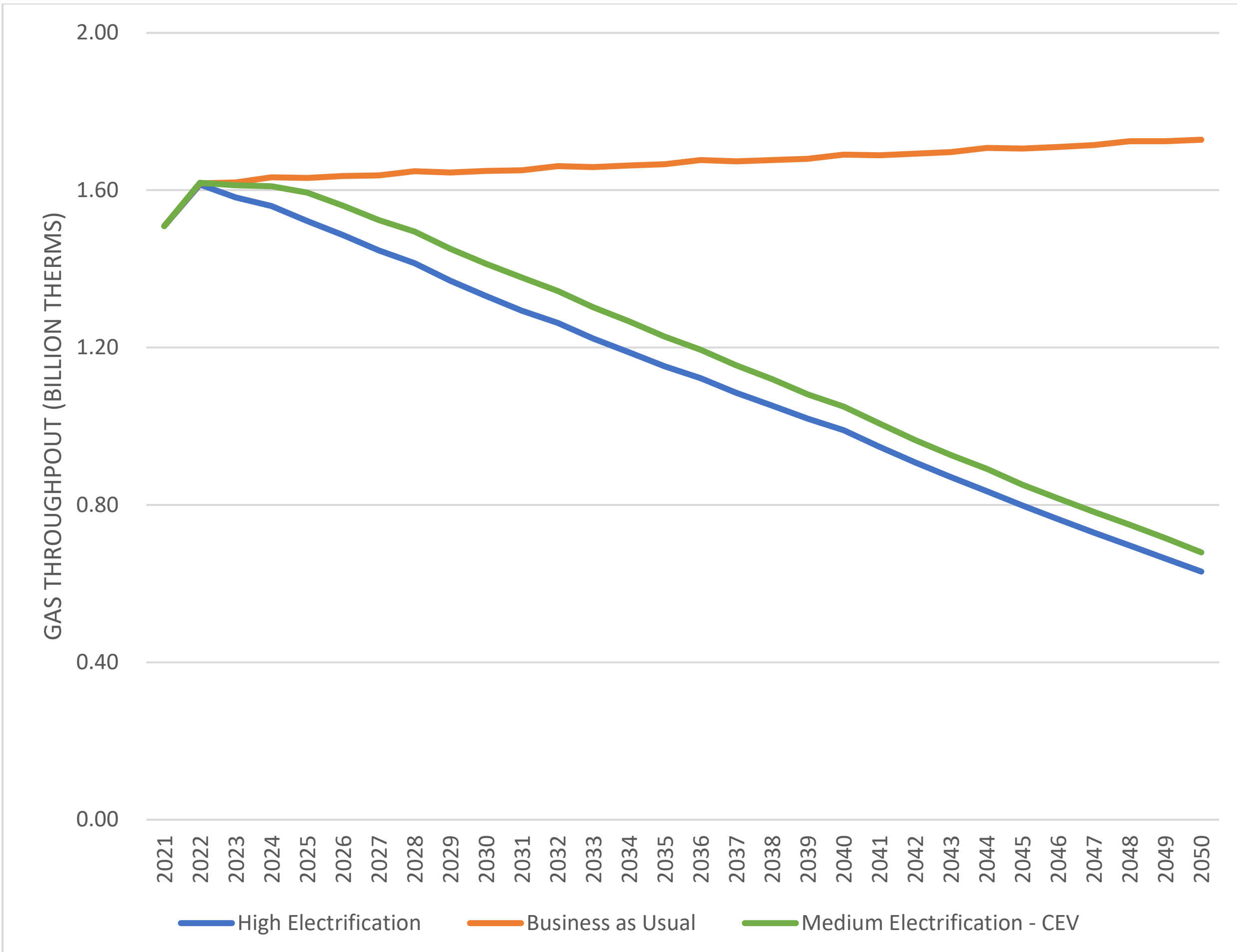


Figure A-2c. Projected Gas Throughput, 2021-2050 (NMPC)



Capital Expenditures

Forecast of capital expenditures, described more fully below, are based on National Grid's projections for each business assumption scenario. National Grid notes that capital expenditure scenarios constructed for purposes of this analysis are not based on engineering studies and do not represent long-term business forecasts.

For the business as usual scenario, capital expenditure projections for the next ten years (2023-2032) reflect the company's current expectations for mandated and safety-related projects, reliability projects, and capacity projects required to serve forecasted demand. From 2033 through 2050, projections encompass National Grid's planned long-term gas main replacement programs through 2045 as well as nominal increases in other types of capex.

The high electrification scenario includes adjustments to business as usual capital expenditures in order to reduce system investments being made on behalf of customers. These include high-level reductions to levels of mandated and safety-related investment, reliability investment, and capacity investment. Most adjustments are made in 2033 and beyond, reflecting the expected need for continued investment at the BAU level in the next 10 years.

The medium electrification - CEV scenario includes upward adjustments to business as usual capital expenditures in order to enable the delivery of renewable natural gas and clean hydrogen.

The figures on the following pages provide the capital expenditure forecasts for each scenario for each operating company. Generally, the declines in capital expenditures that can be seen in the graphs for each operating Company align with the conclusion of programs such as the gas main replacement program.

Figure A-3a. Projected Capital Expenditures, 2021-2050 (KEDLI)

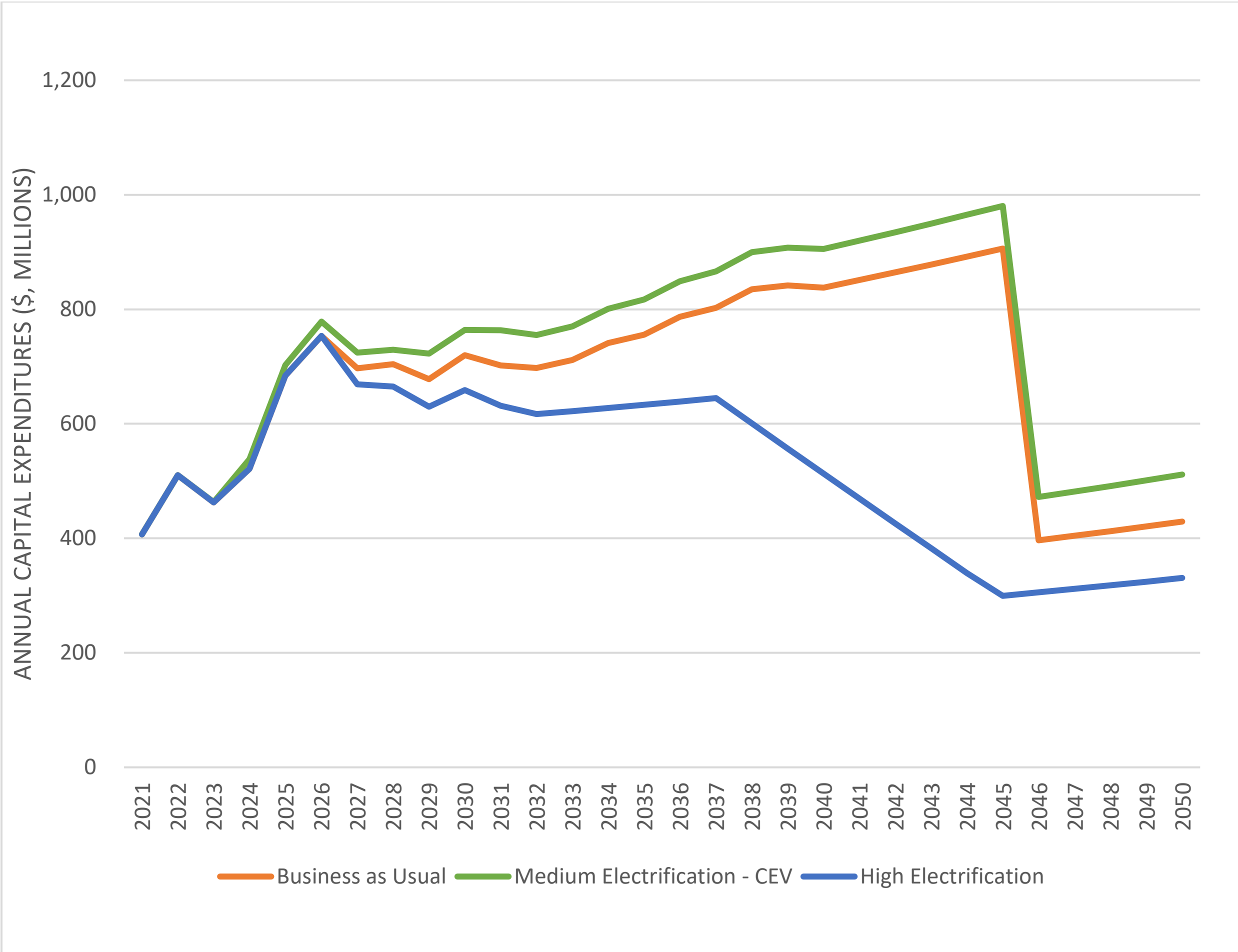


Figure A3b. Projected Capital Expenditures, 2021-2050 (KEDNY)

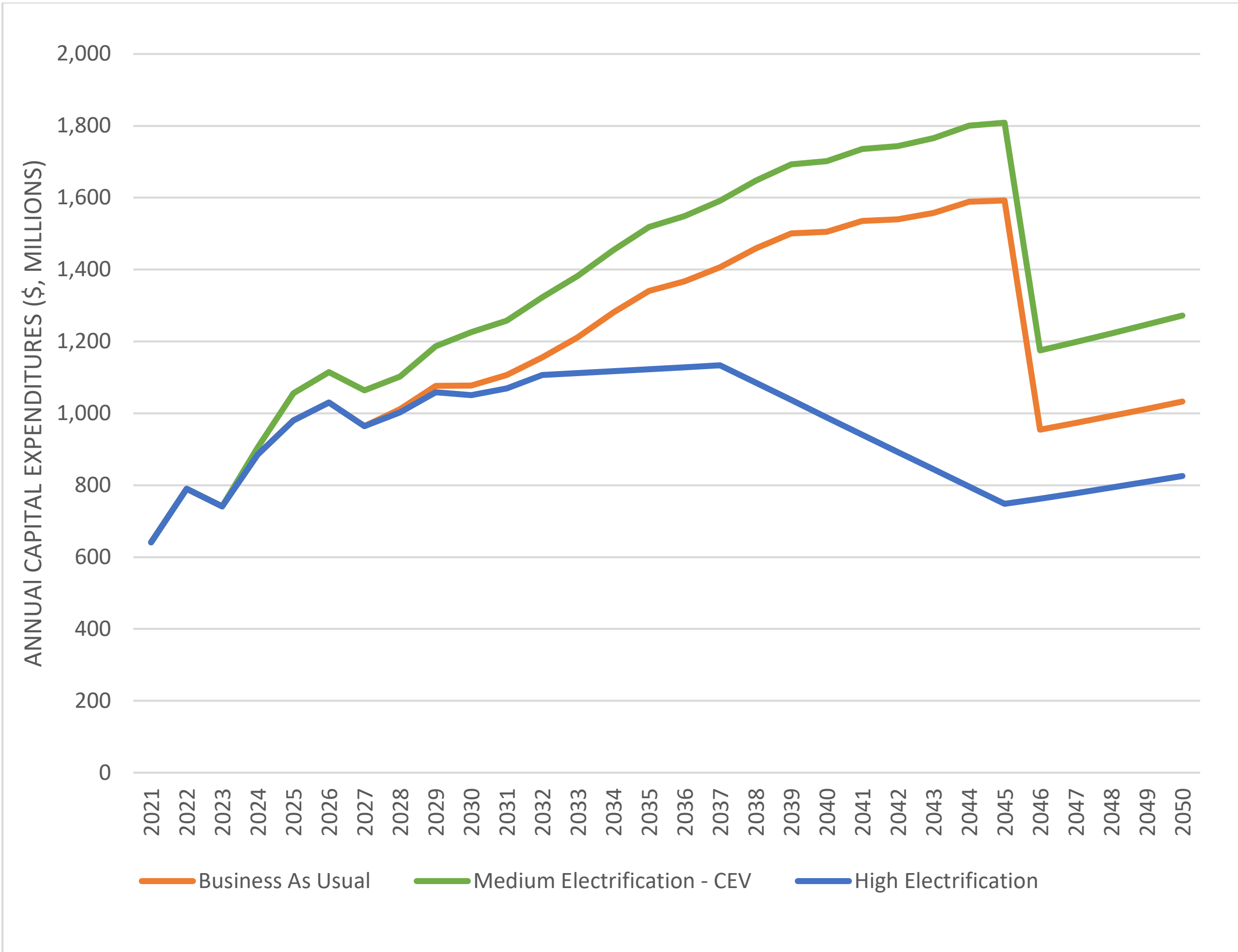
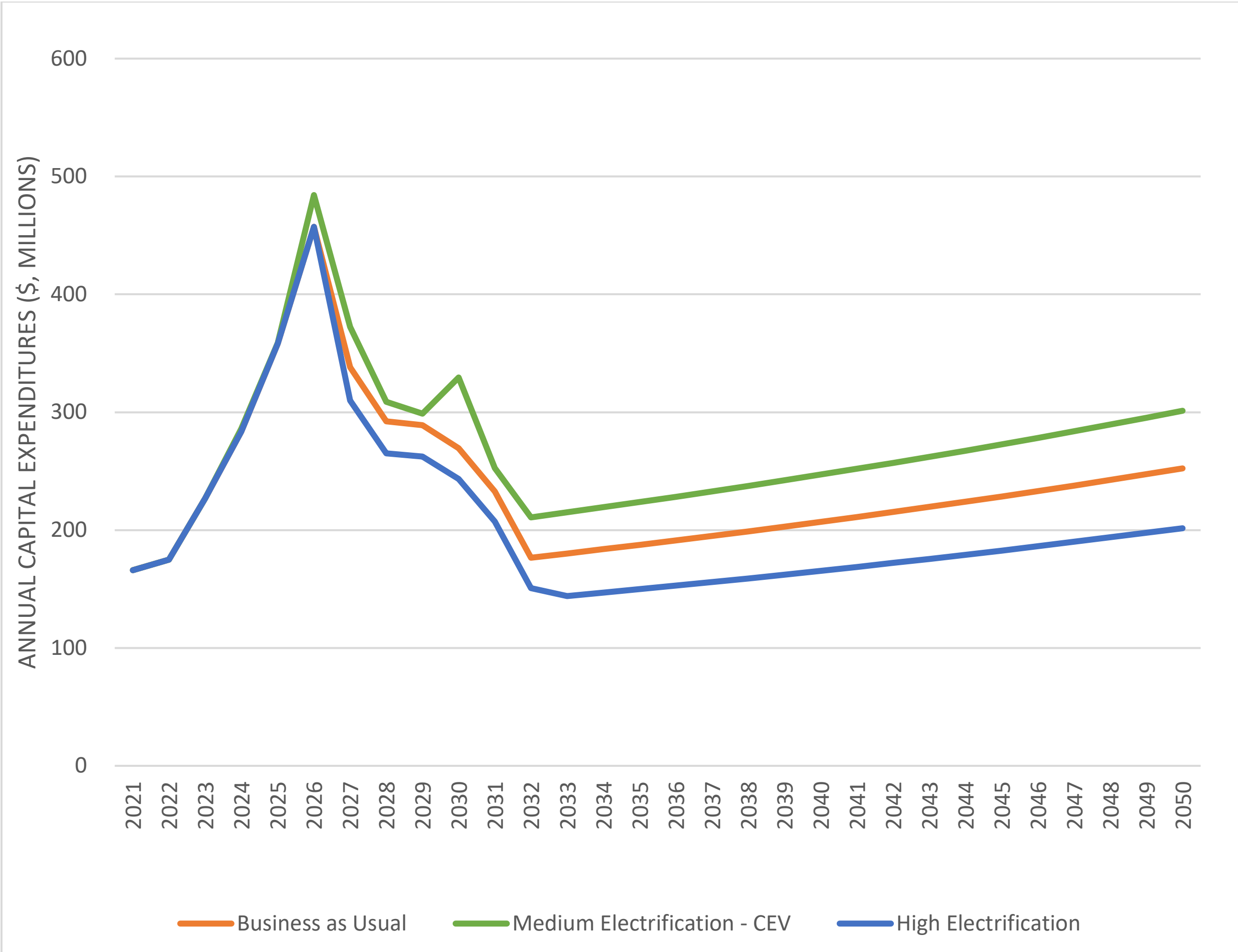


Figure A-3c. Projected Capital Expenditures, 2021-2050 (NMPC)



ANALYSES BY CUSTOMER CLASS

Revenue requirement modeling for this study was primarily performed for each operating company as a whole. The challenges and uncertainty involved in forecasting revenues for the next thirty years have been discussed in more detail in Part II of this report. Due to these factors, the additional complexity of modeling costs and revenues by customer class has not been incorporated into the modeling Gannett Fleming has performed for National Grid and other New York utilities. However, over the next three decades the overall composition of a utility's customer base may change as the state moves towards achieving the CLCPA's greenhouse gas emission goals.[41] The detail of forecast data for National Grid allows for additional analyses to assess the potential impact of a changing composition of customers.

Two approaches were used to assess how the customer composition may impact long-term customer bills. The first was to analyze the results on a per-unit of consumption basis. Figures A-4a, A-4b, A-4c, A-5a, A-5b and A-5c below provide the projected revenue requirements on a per-therm basis for both the high electrification and medium electrification – CEV scenarios.

[41] For example, in 2050 industrial customers may comprise a larger share of a utility's overall customer base than is the case today.

Figure A-4a. Projected Revenue Requirement Per Therm
High Electrification - All Scenarios (KEDLI)

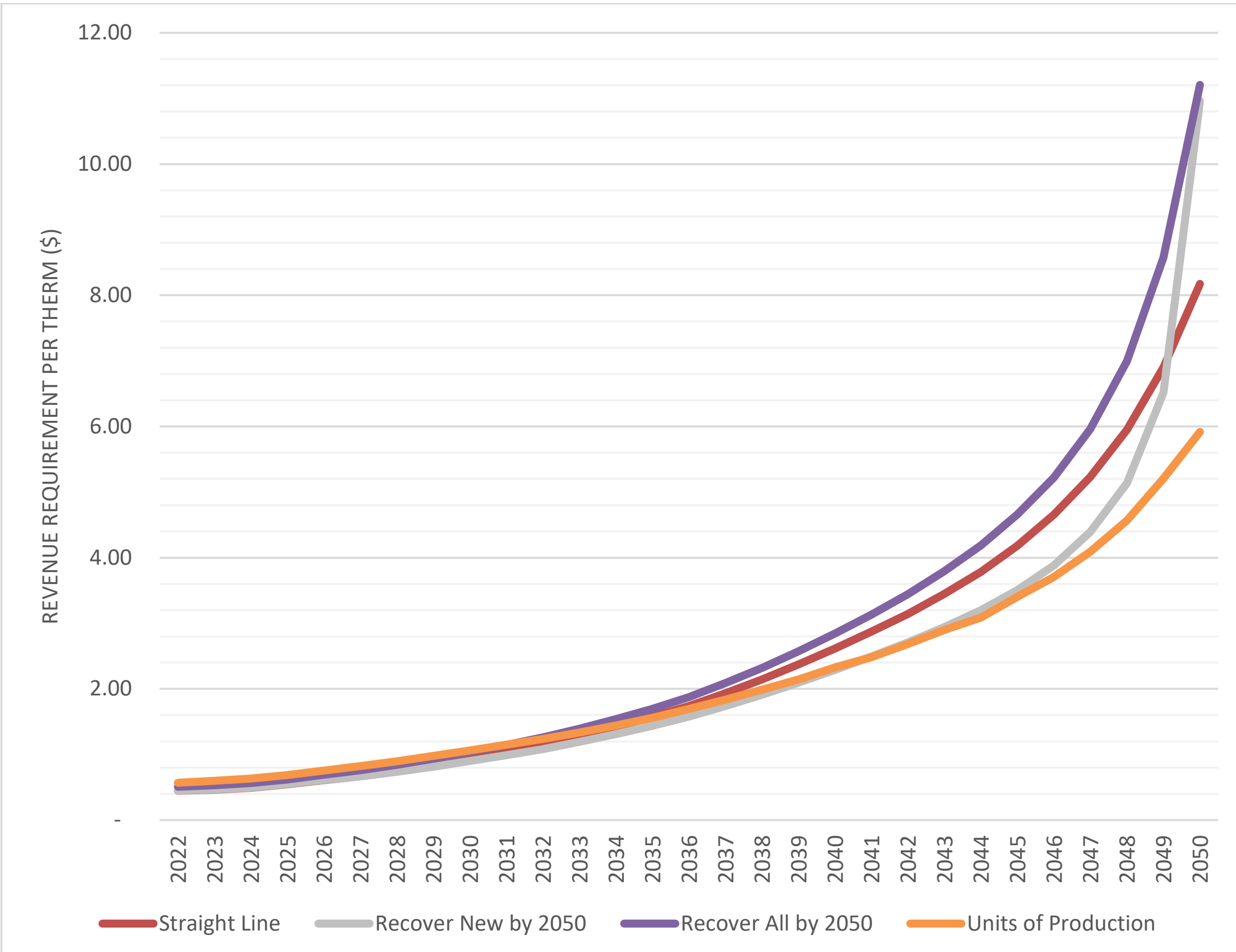


Figure A-4b. Projected Revenue Requirement Per Therm
High Electrification - All Scenarios (KEDNY)

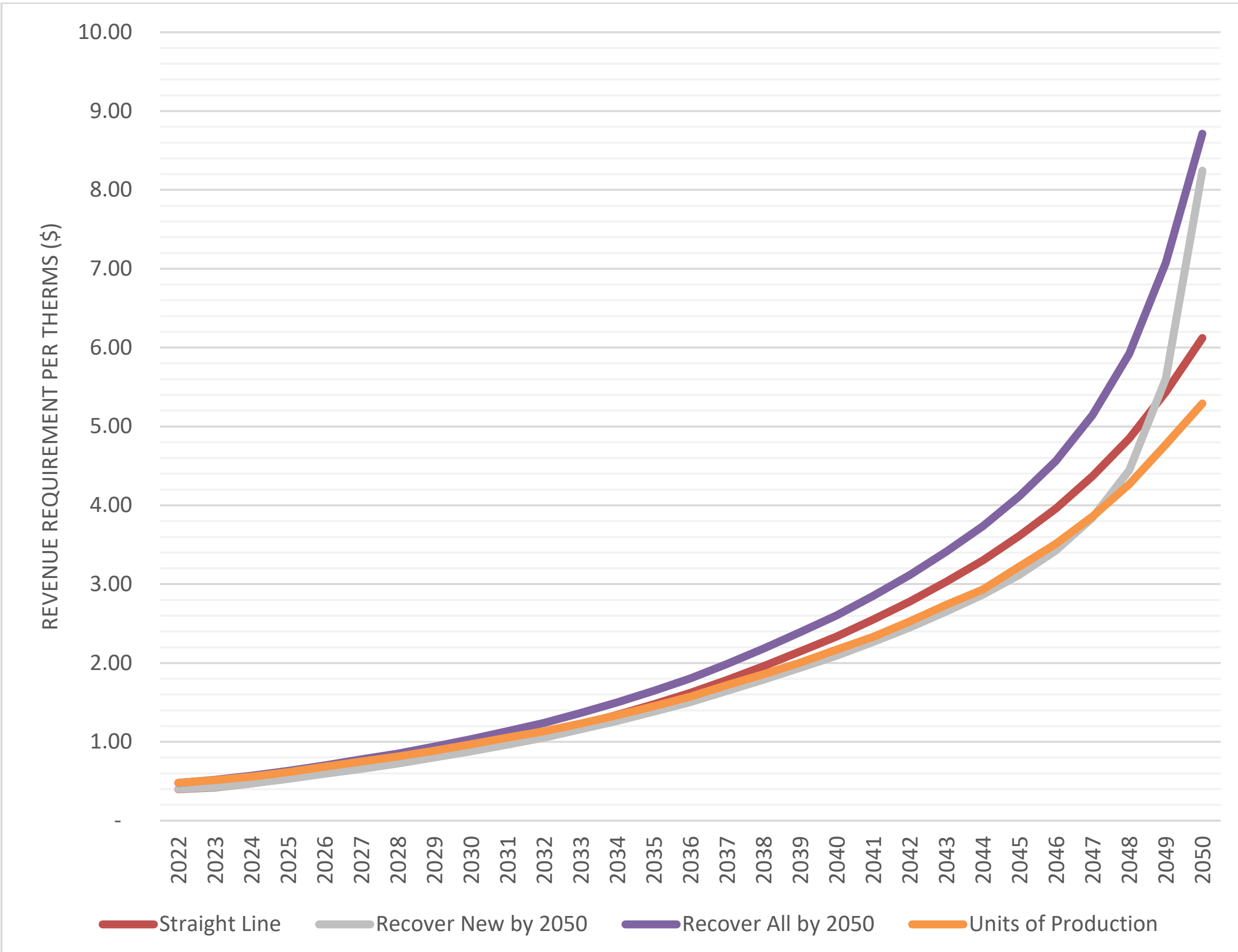


Figure A-4c. Projected Revenue Requirement Per Therm
High Electrification - All Scenarios (NMPC)

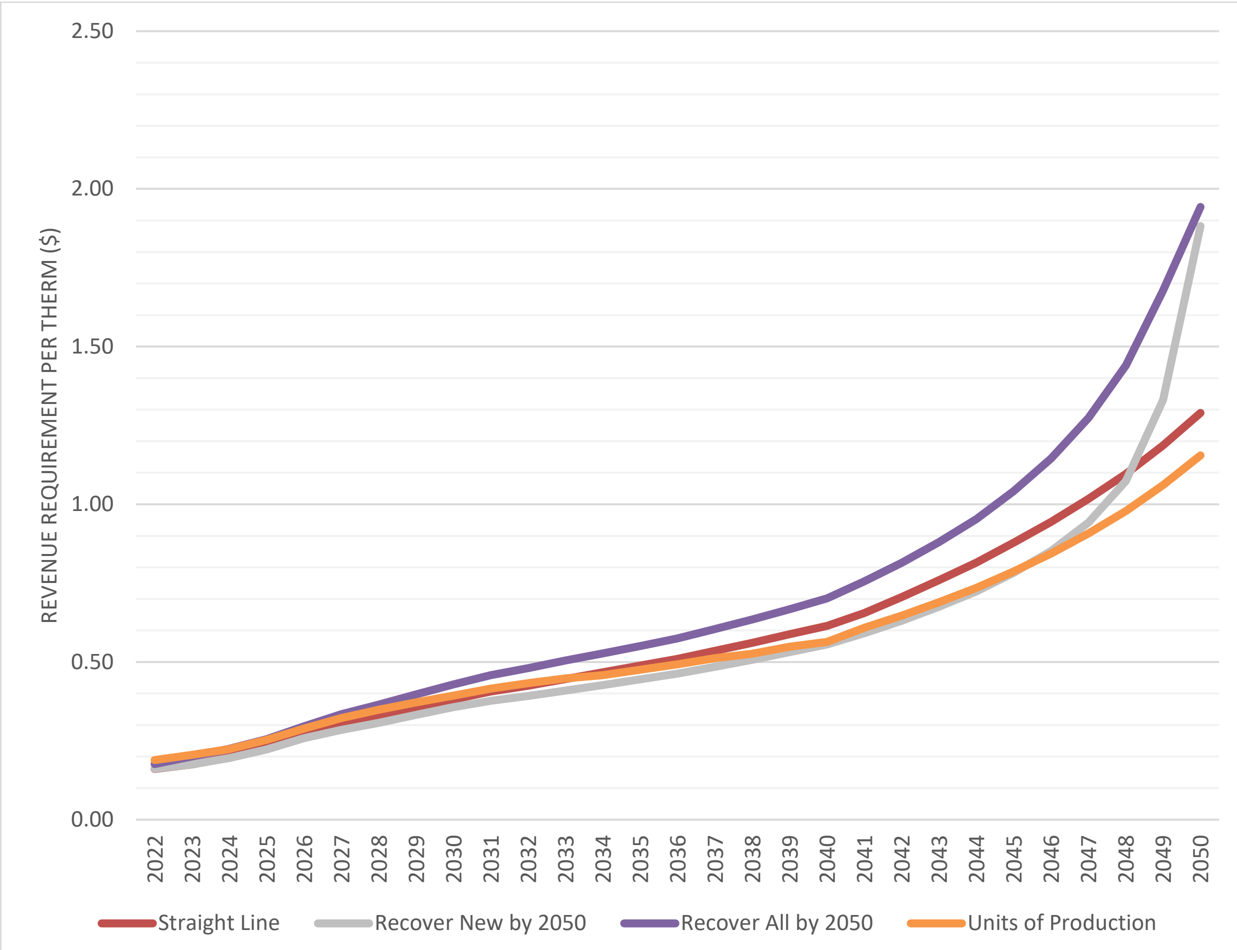


Figure A-5a. Projected Revenue Requirement Per Therm
Medium Electrification - CEV – Straight Line and UoP (KEDLI)

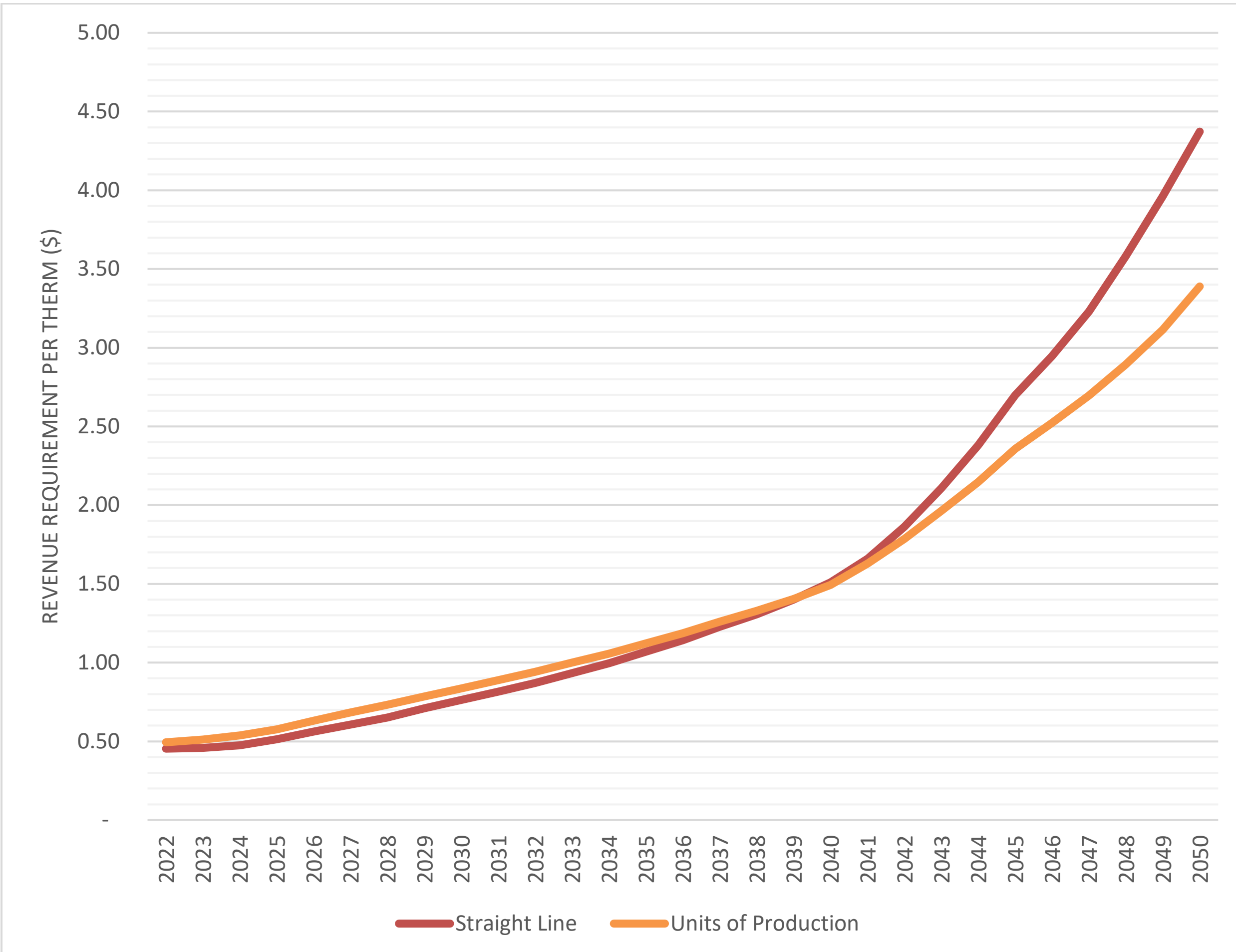


Figure A-5b. Projected Revenue Requirement Per Therm
Medium Electrification - CEV – Straight Line and UoP (KEDNY)

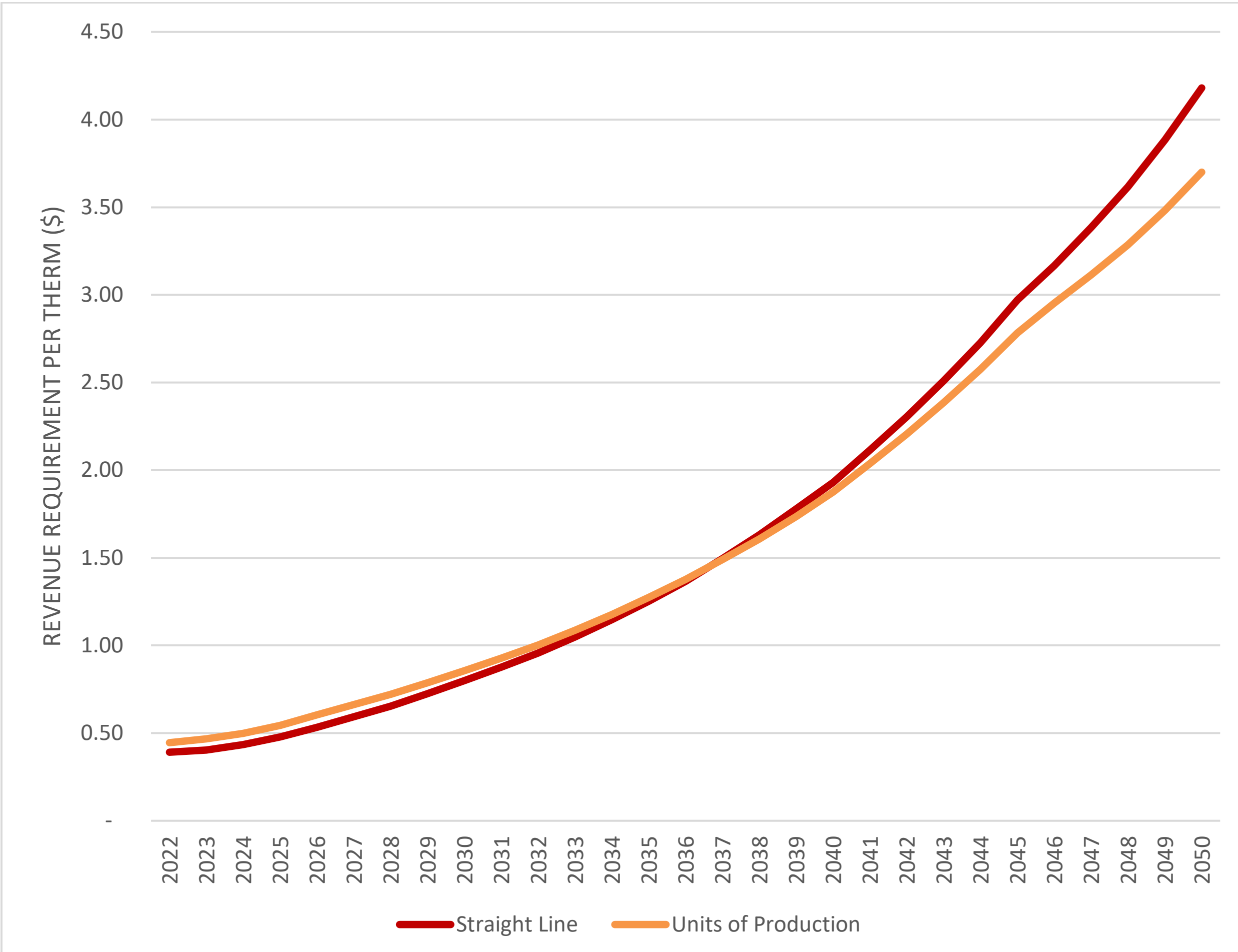
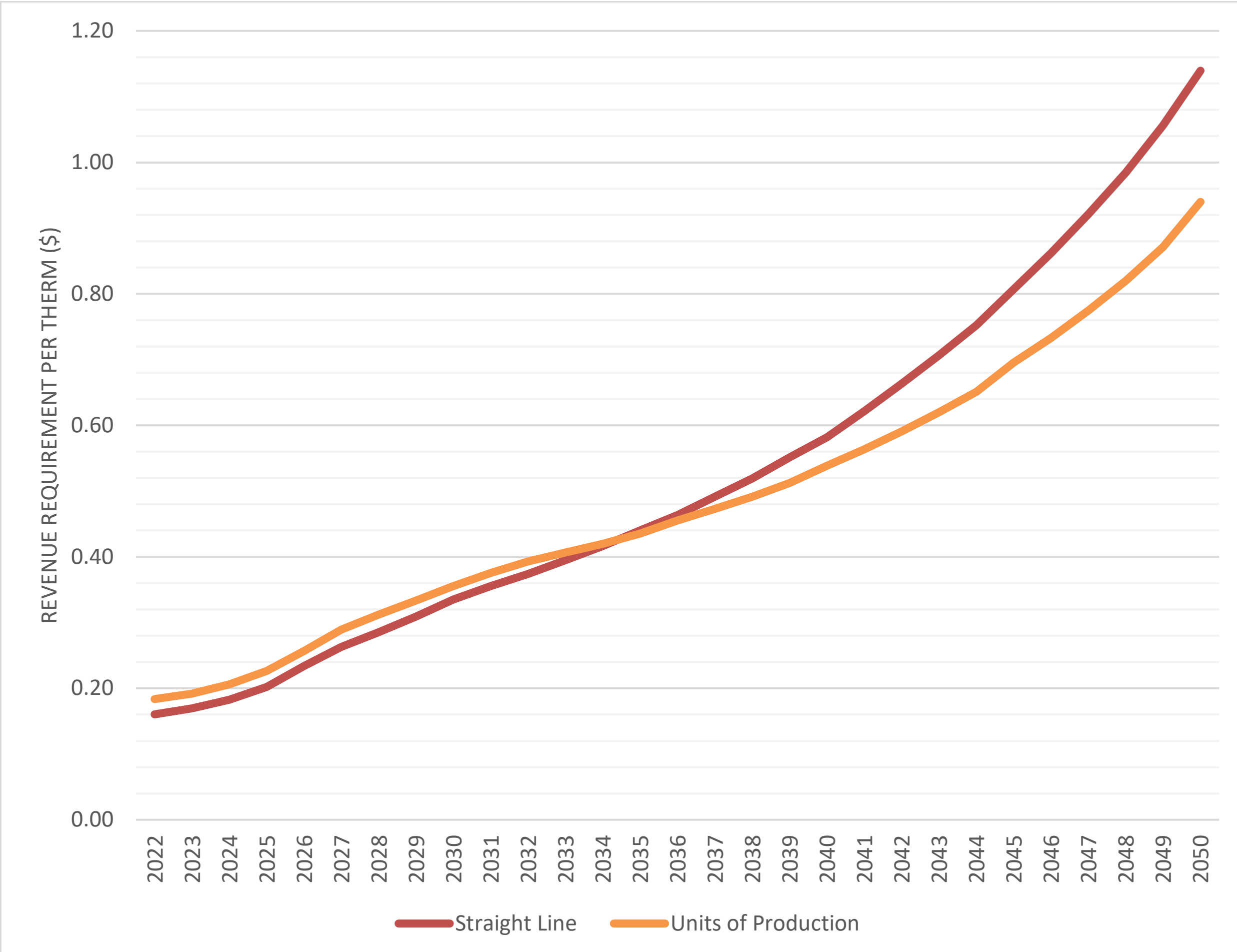


Figure A-5c. Projected Revenue Requirement Per Therm
Medium Electrification - CEV – Straight Line and UoP (NMPC)



The second approach incorporated National Grid's forecasts of customer counts and gas throughput by customer class. Under certain business assumptions, most prominent the high electrification scenario, the declines in customers is not uniform across customer classes. As a result, the metric used in the study, which is the revenue requirement per customer, will change as a result of the changing composition of remaining customers (*e.g.*, if a higher proportion of customers are industrial customers, then the average bill would likely increase due to a higher volume of gas consumed per customer). In addition to the results discussed in Part II of this report, which were performed in total and not separately by customer class, analyses were also performed to assess the revenue requirement per customer separately for residential and for commercial and industrial customers.

As with any forecast, simplifying assumptions were made about the future. For the analyses presented below in Figures A-6a through A-6f and A-7a through A-7f, the assumption was made that commercial and industrial bills would generally maintain a similar proportion to one another on a volumetric basis.[42] The revenue requirement for the residential and commercial and industrial ("CI") customer classes were then assumed to be allocated in proportion to the number of units of gas consumed by each class, adjusted for the current revenue requirement per unit for each class.

These results of this analysis are set forth below and generally follow a similar pattern to the analyses presented in Part II of this report. These analyses, as well as a review of the revenue requirement forecasts on a per-therm basis provided in Figures A-4a, A-4b, A-4c, A-5a, A-5b and A-5c above, support the primary conclusions in this report that were modeled on a total customer basis.

[42] For example, if the revenue requirement per-therm for commercial and industrial customers is three times larger than the revenue requirement per-therm for residential customers, then this ratio was assumed to remain constant through 2050.

Figure A-6a. Projected Revenue Requirement by Customer Class
Residential
High Electrification – All Scenarios (KEDLI)

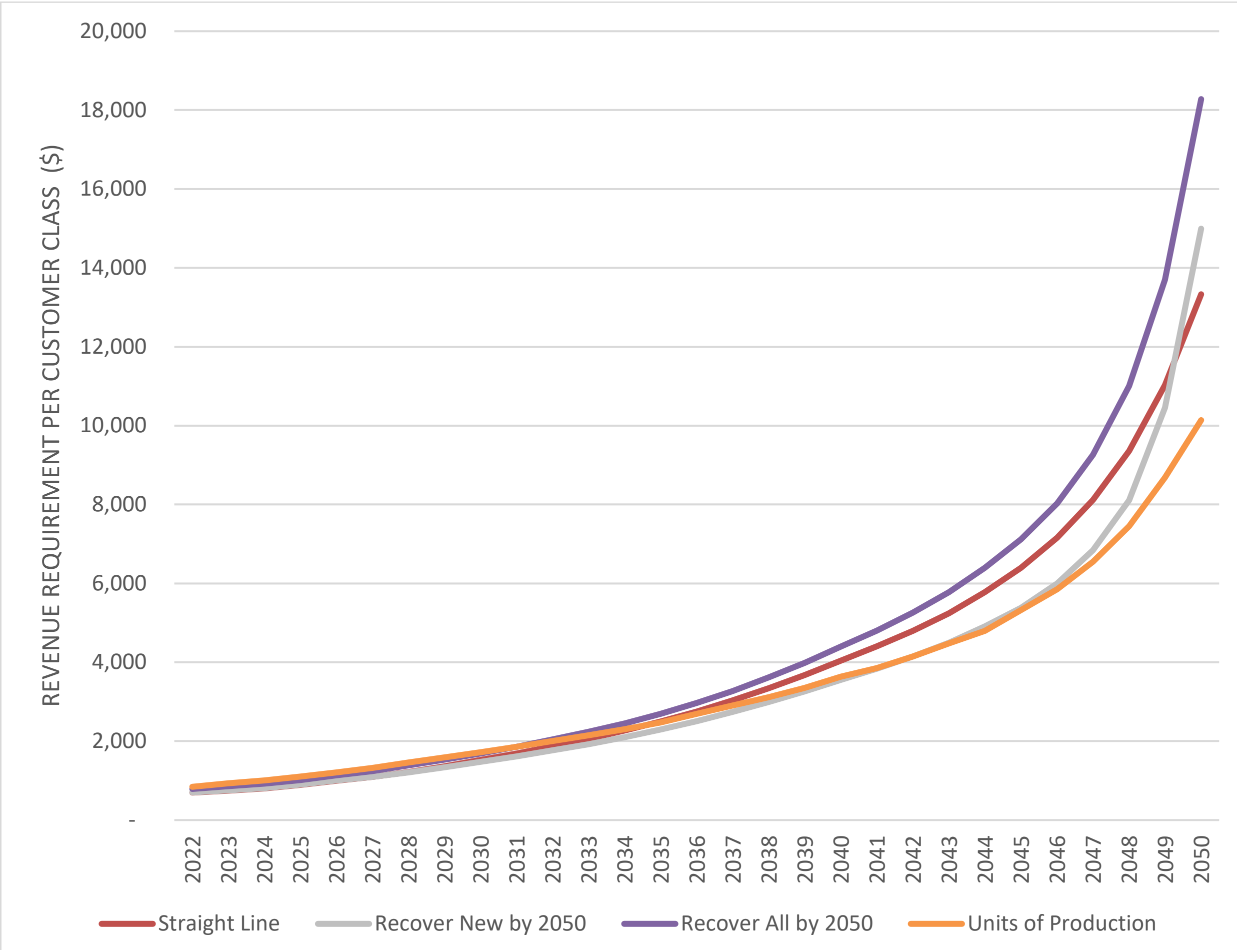


Figure A-6b. Projected Revenue Requirement by Customer Class Commercial/Industrial High Electrification – All Scenarios (KEDLI)

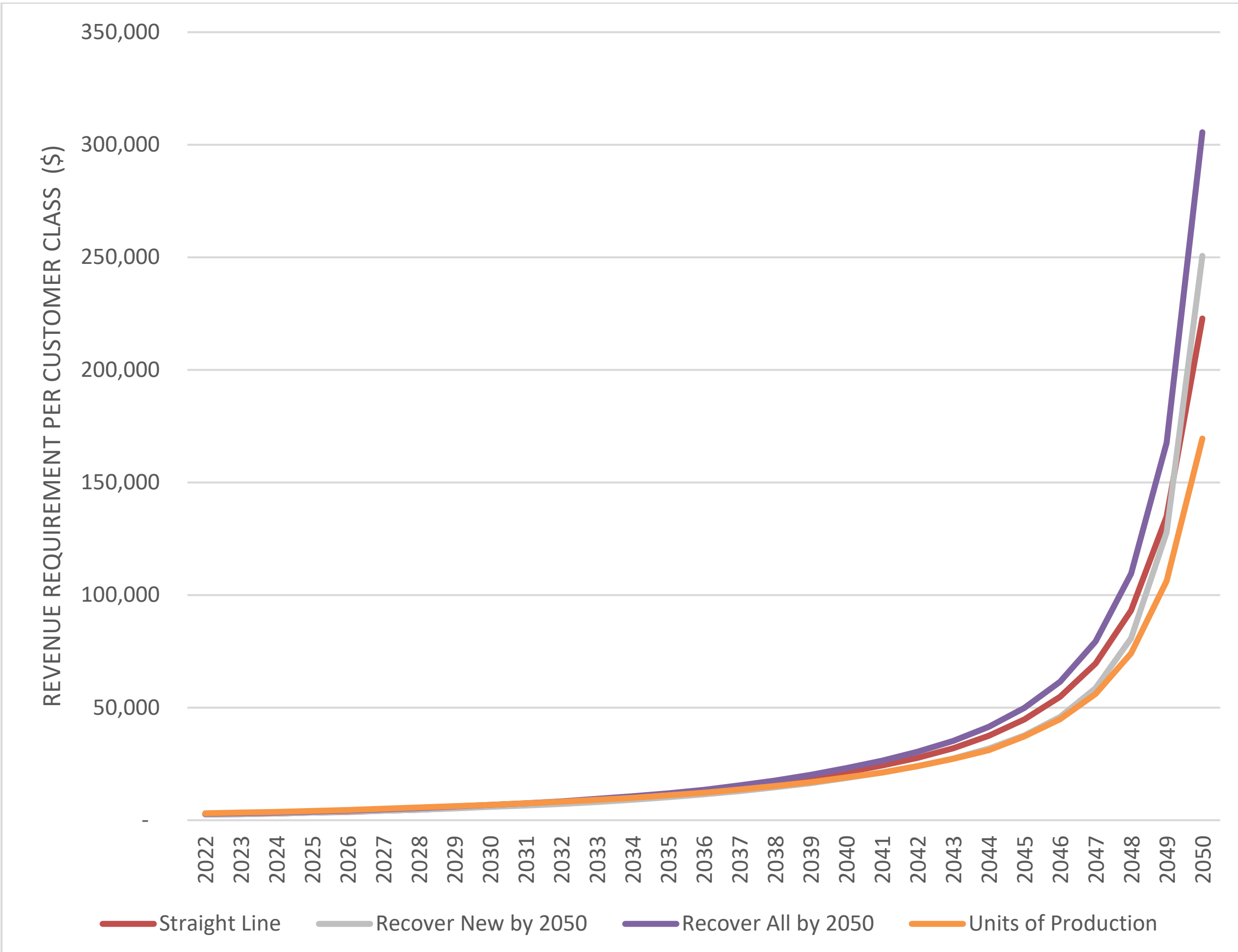


Figure A-6c. Projected Revenue Requirement by Customer Class
Residential
High Electrification – All Scenarios (KEDNY)

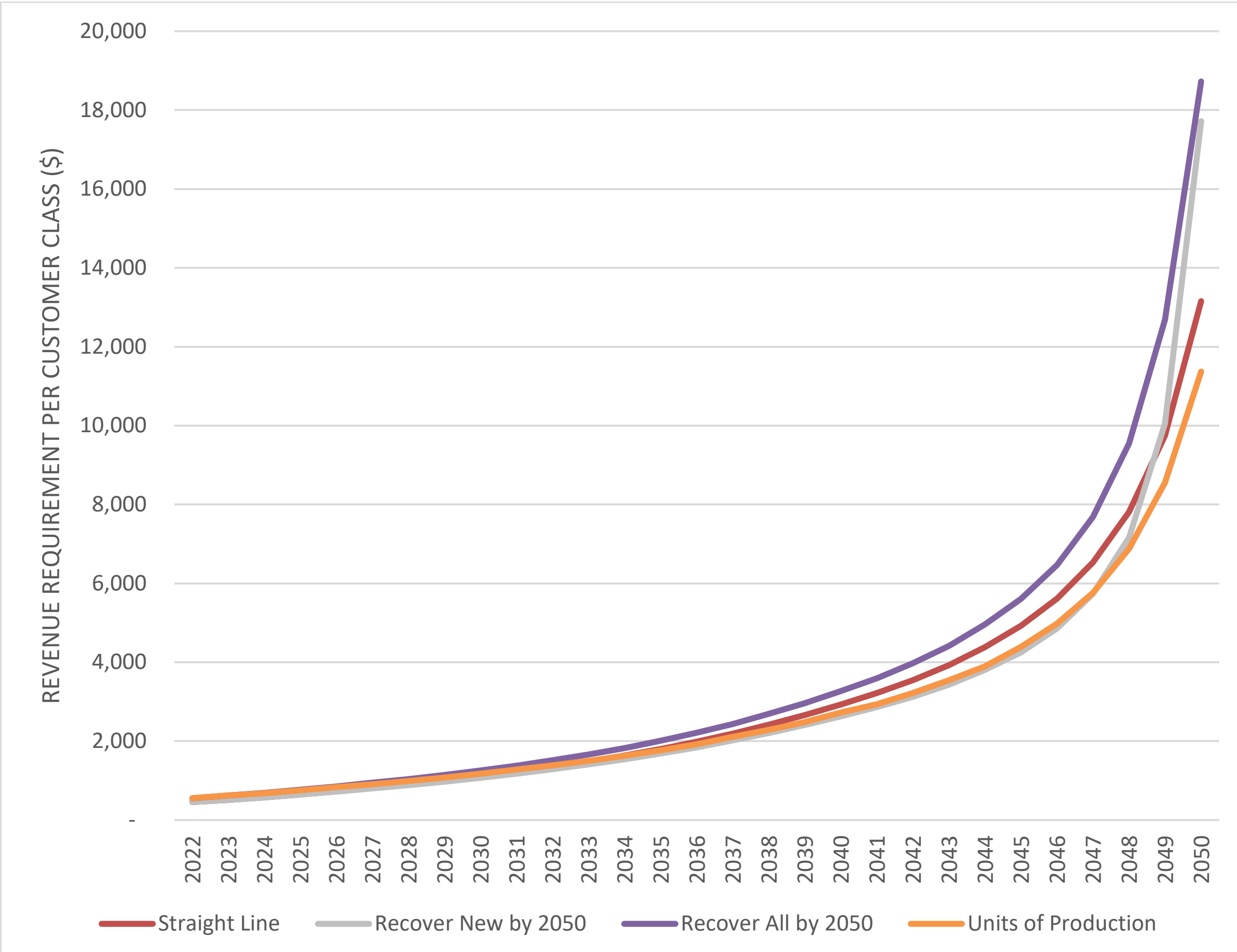


**Figure A-6d. Projected Revenue Requirement by Customer Class
Commercial/Industrial
High Electrification – All Scenarios (KEDNY)**

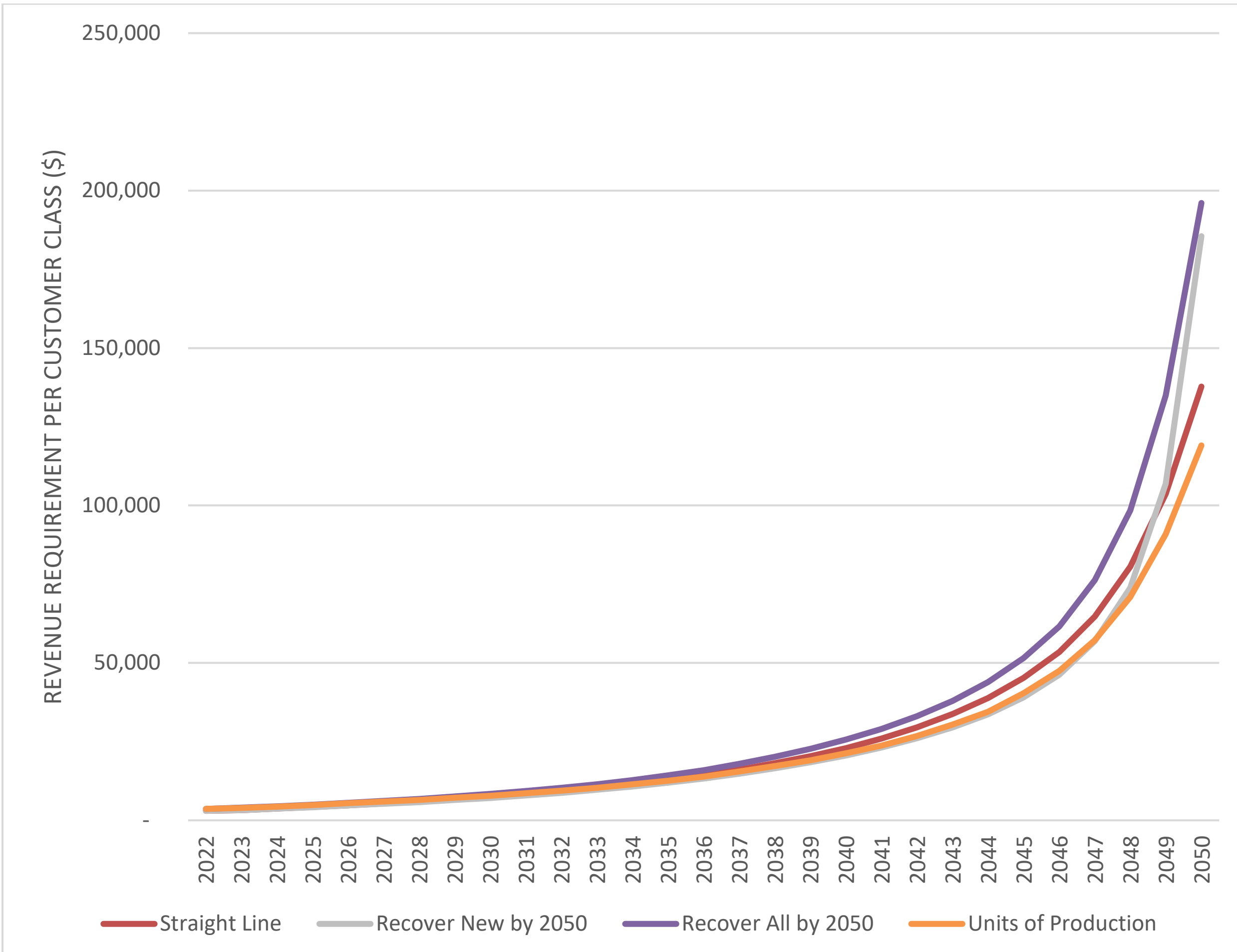


Figure A-6e. Projected Revenue Requirement by Customer Class
Residential
High Electrification – All Scenarios (NMPC)

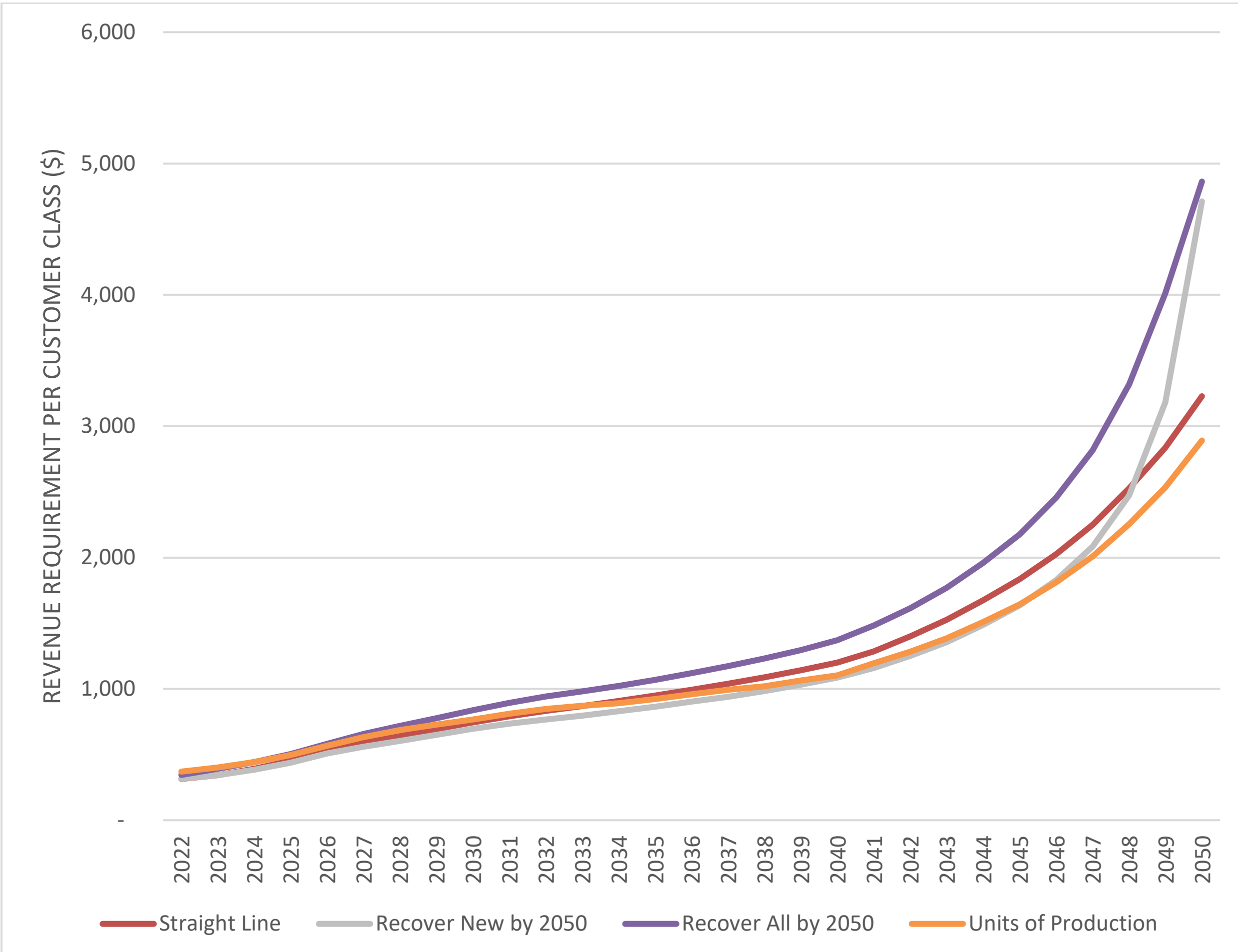


Figure A-6f. Projected Revenue Requirement by Customer Class
Commercial/Industrial
High Electrification – All Scenarios (NMPC)

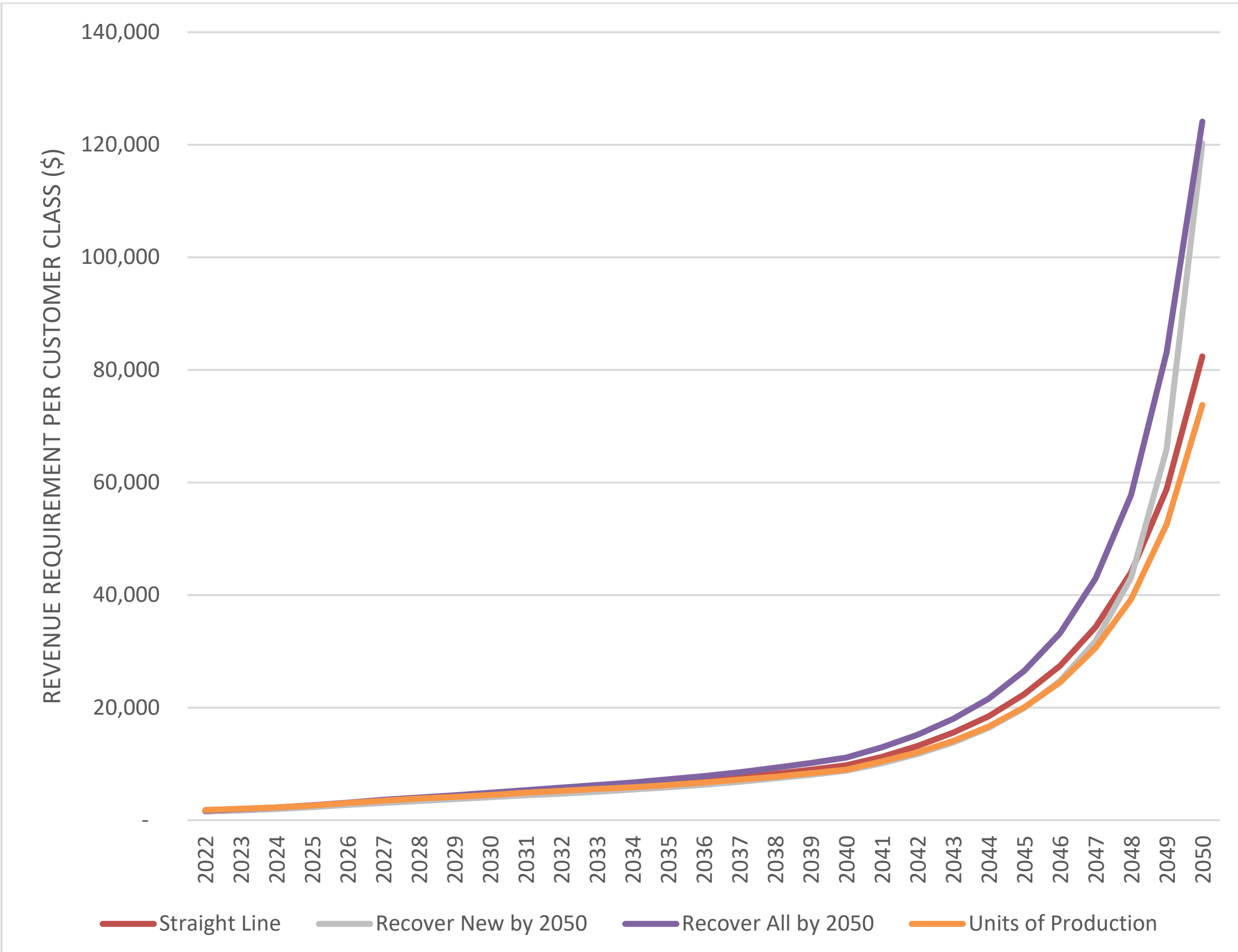


Figure A-7a. Projected Revenue Requirement by Customer Class Residential Medium Electrification - CEV – Straight Line and UoP Scenarios (KEDLI)

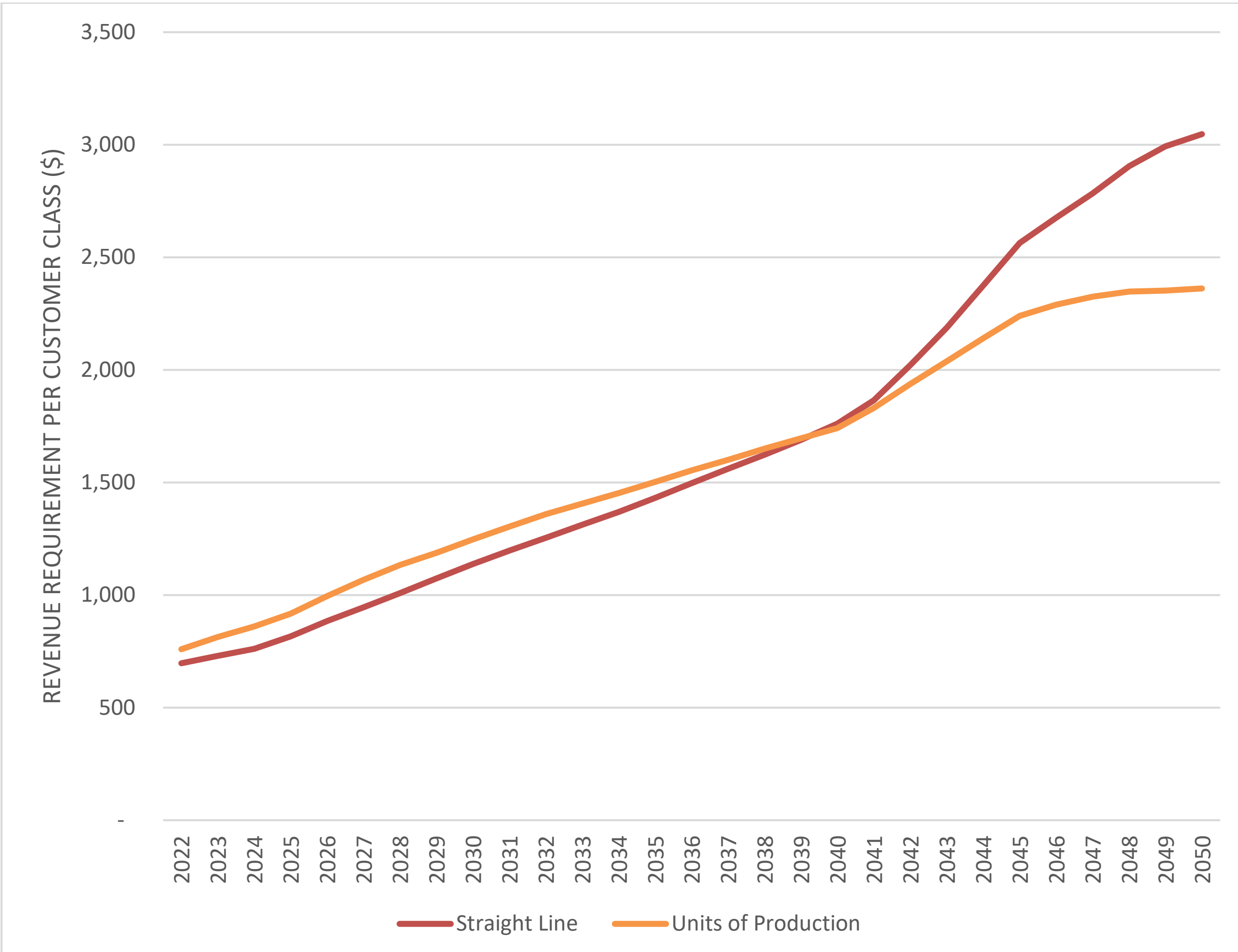


Figure A-7b. Projected Revenue Requirement by Customer Class
Commercial/Industrial
Medium Electrification - CEV – Straight Line and UoP Scenarios (KEDLI)

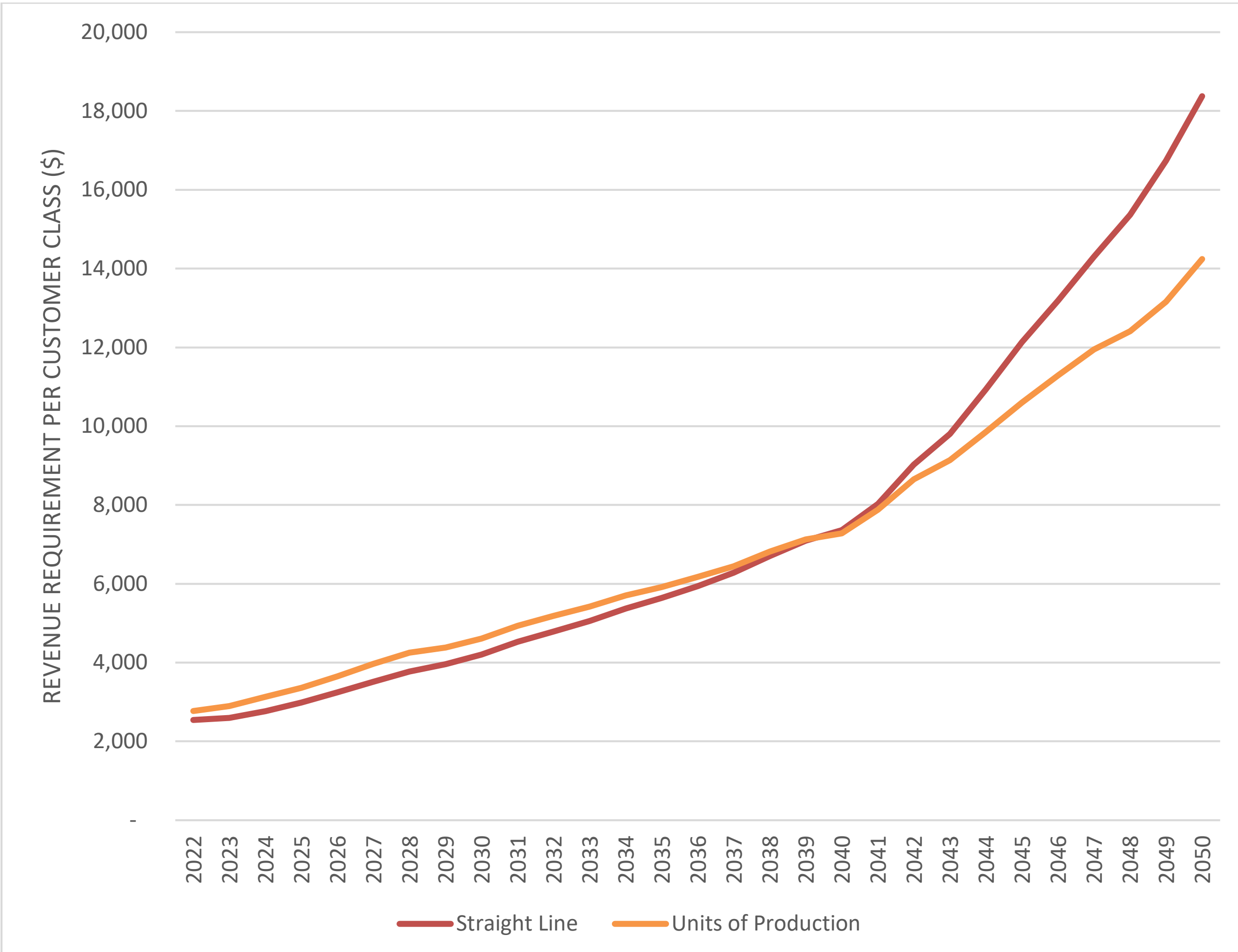


Figure A-7c. Projected Revenue Requirement by Customer Class
Residential
Medium Electrification - CEV – Straight Line and UoP Scenarios (KEDNY)

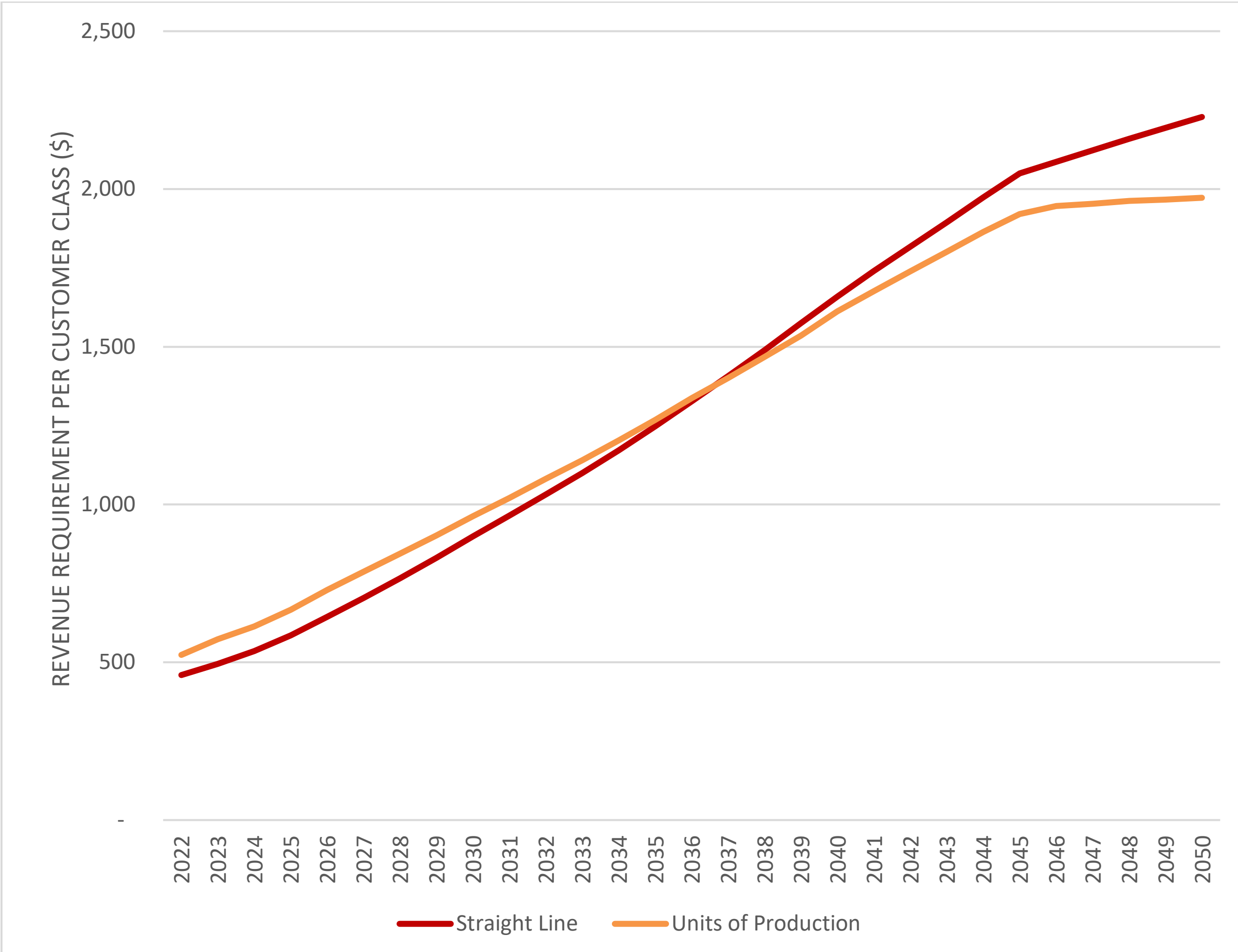


Figure A-7d. Projected Revenue Requirement by Customer Class
Commercial/Industrial
Medium Electrification - CEV – Straight Line and UoP Scenarios (KEDNY)

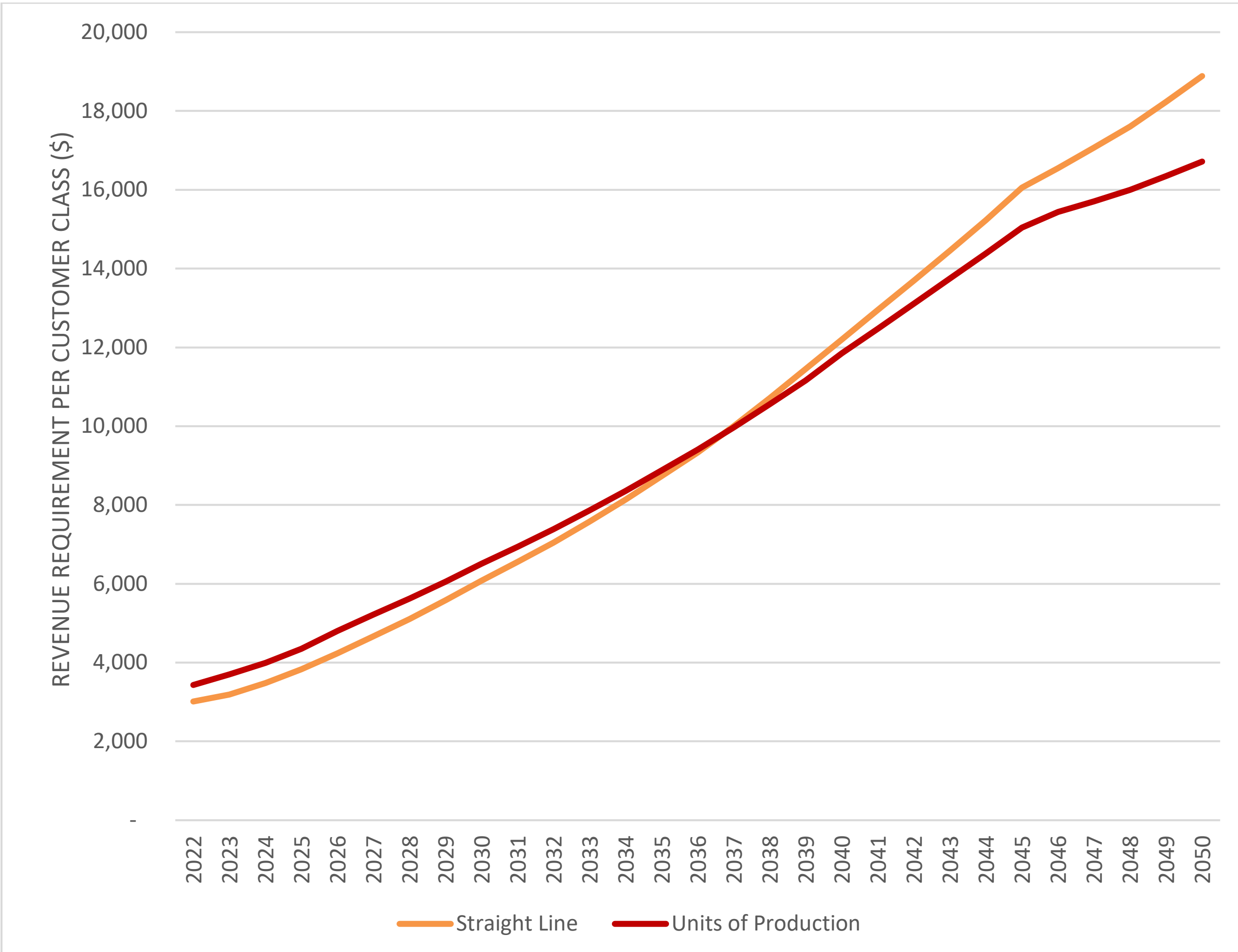


Figure A-7e. Projected Revenue Requirement by Customer Class
Residential
Medium Electrification - CEV – Straight Line and UoP Scenarios (NMPC)

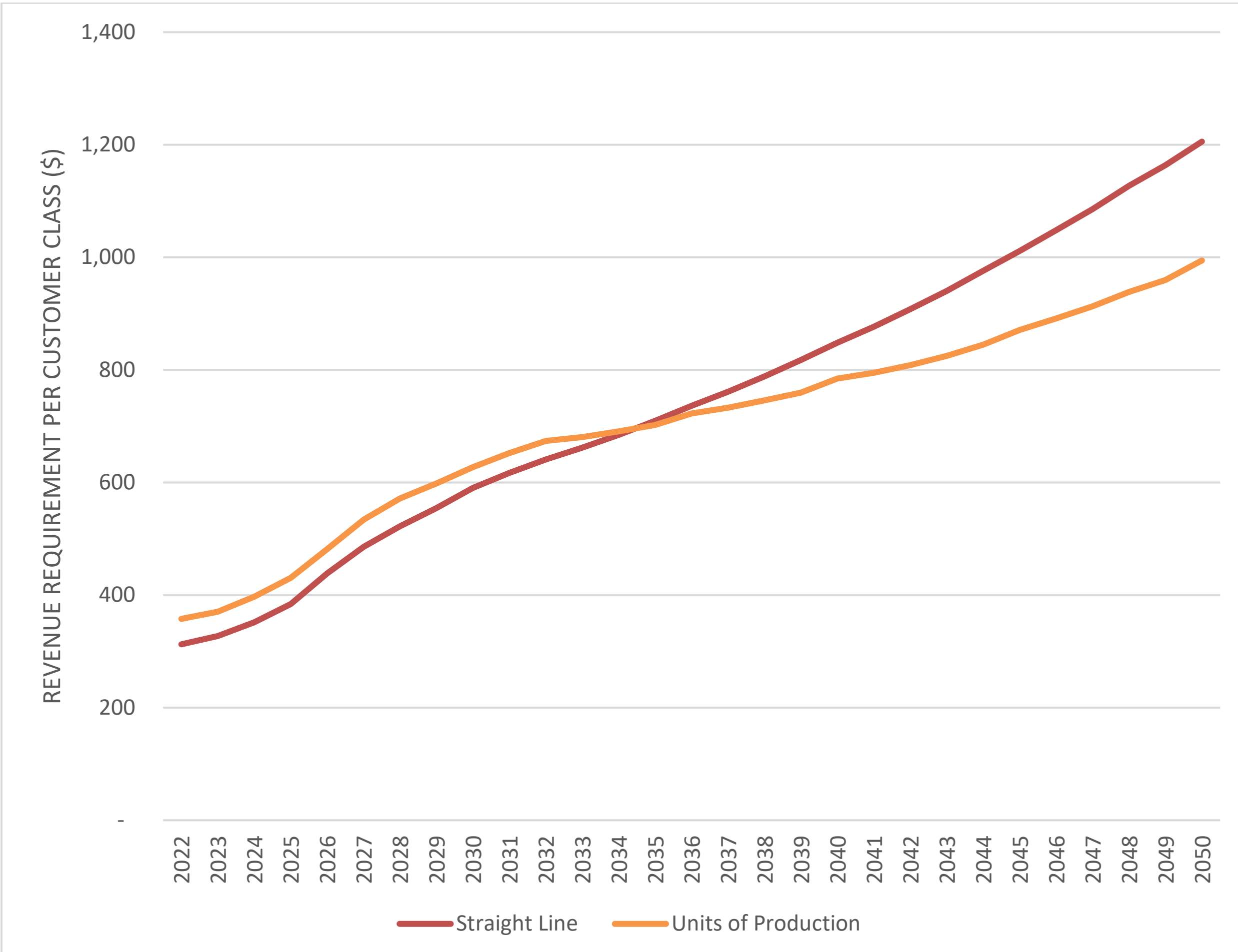
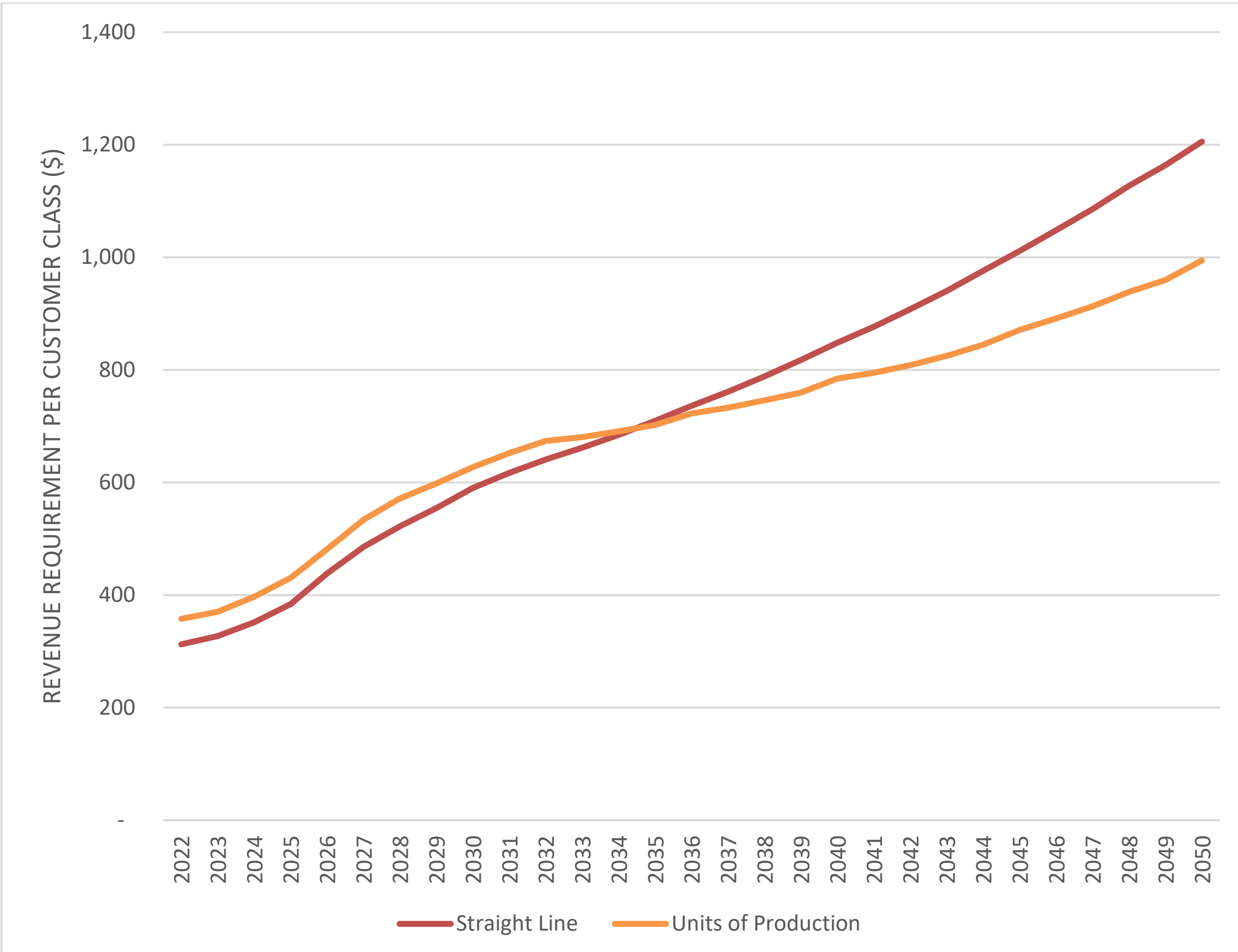


Figure A-7f. Projected Revenue Requirement by Customer Class Commercial/Industrial Medium Electrification - CEV – Straight Line and UoP Scenarios (NMPC)



IMPACT OF THE TIMING OF CHANGES IN DEPRECIATION

As discussed in this report, over the long-run scenarios with lower depreciation tend to result in larger long-term bill impacts. There is also a similar dynamic in terms of the timing of when increases in depreciation are recognized. To help illustrate this concept, the figures below provide the result of delaying the implementation of the UoP method under specific business assumptions.

Each figure is based on the medium electrification – CEV business assumption scenario and shows the same impacts of the straight line and UoP depreciation scenarios have been presented in Part II of this report. The figures also show additional scenarios in which the change to the UoP method is delayed by three, five or ten years (*i.e.*, until 2025, 2027 and 2032).

Figure A-8a. Revenue Requirement Per Customer Based on UoP Implementation Date Medium Electrification – CEV – Straight Line and UoP (KEDLI)

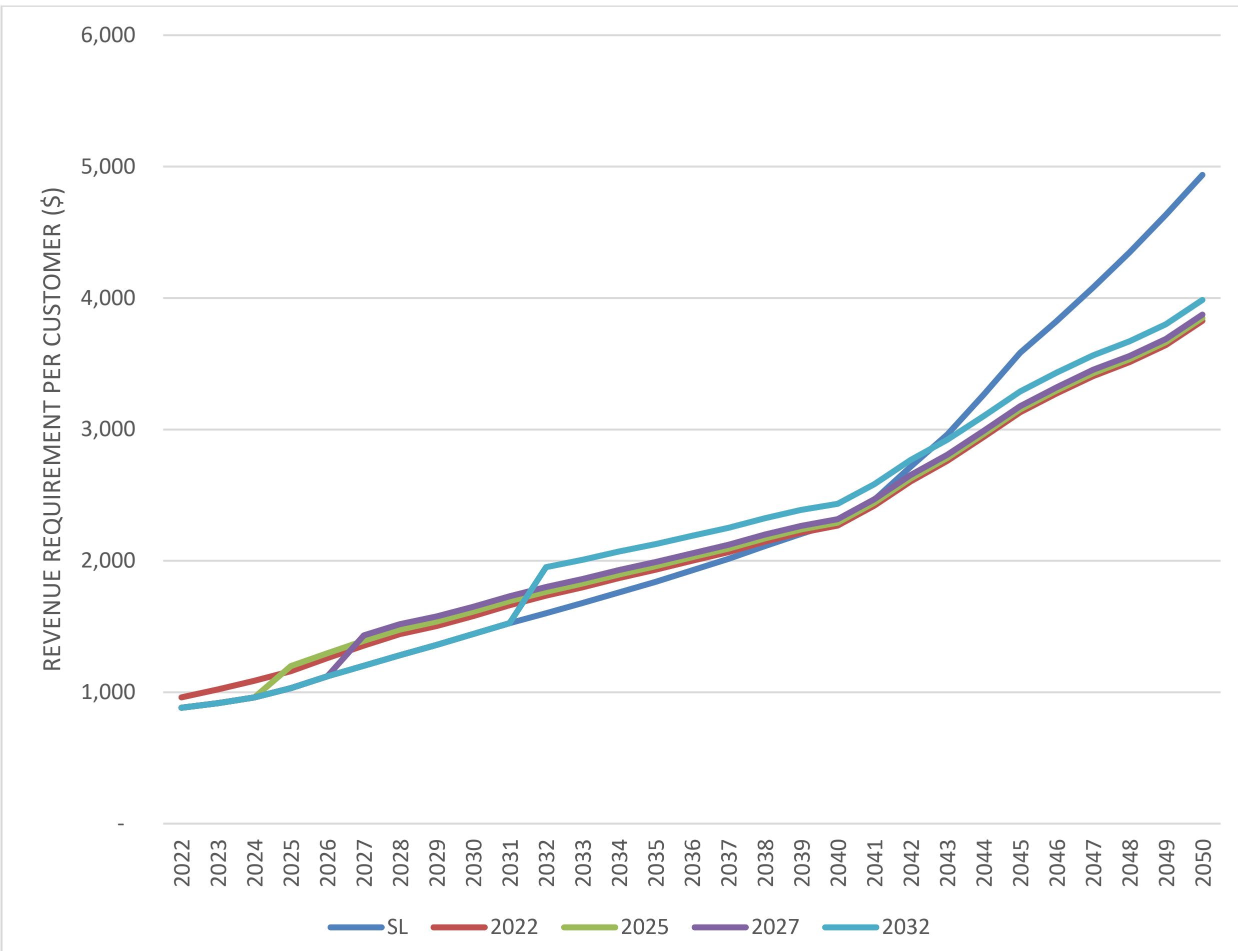


Figure A-8b. Revenue Requirement Per Customer Based on UoP Implementation Date Medium Electrification – CEV – Straight Line and UoP (KEDNY)

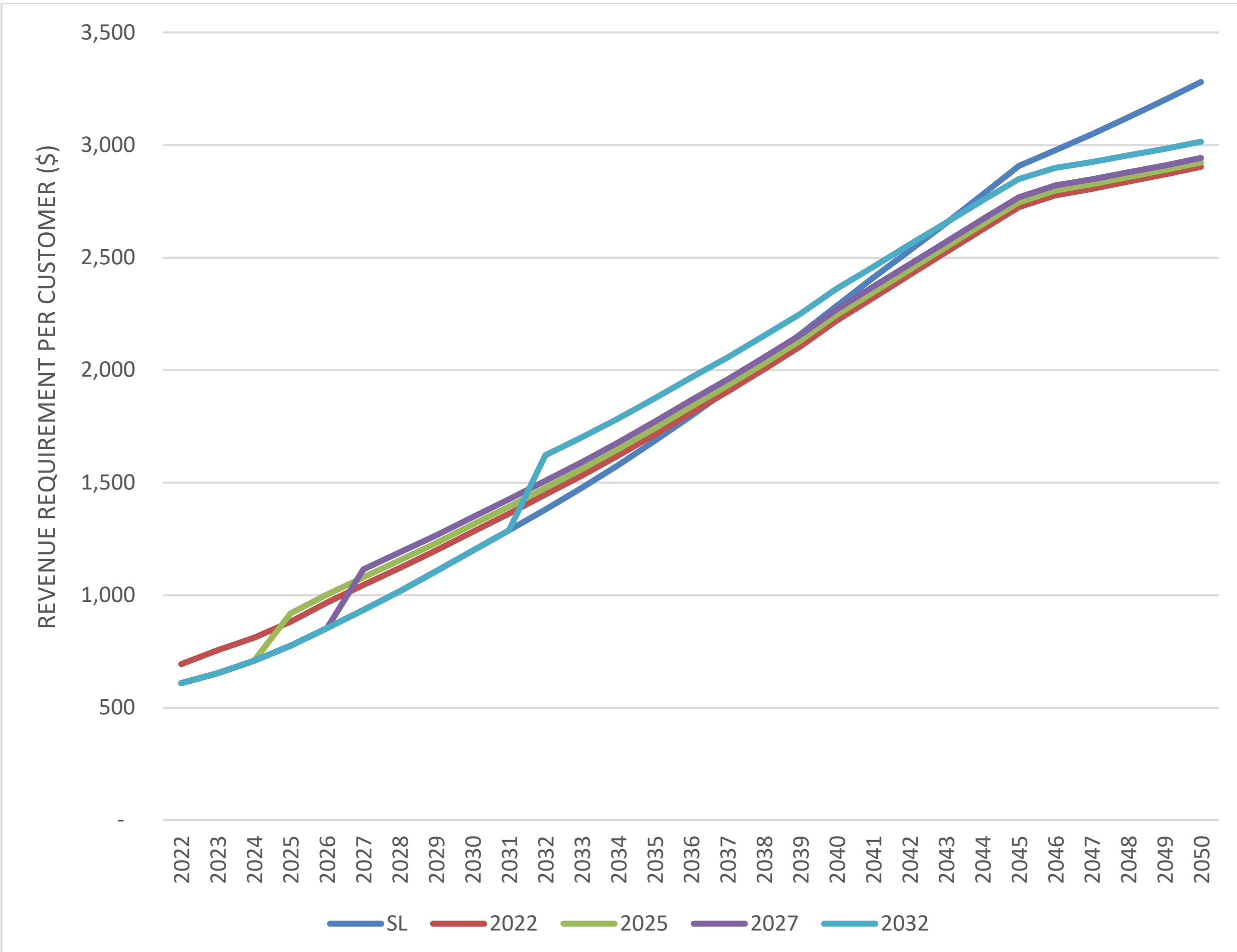
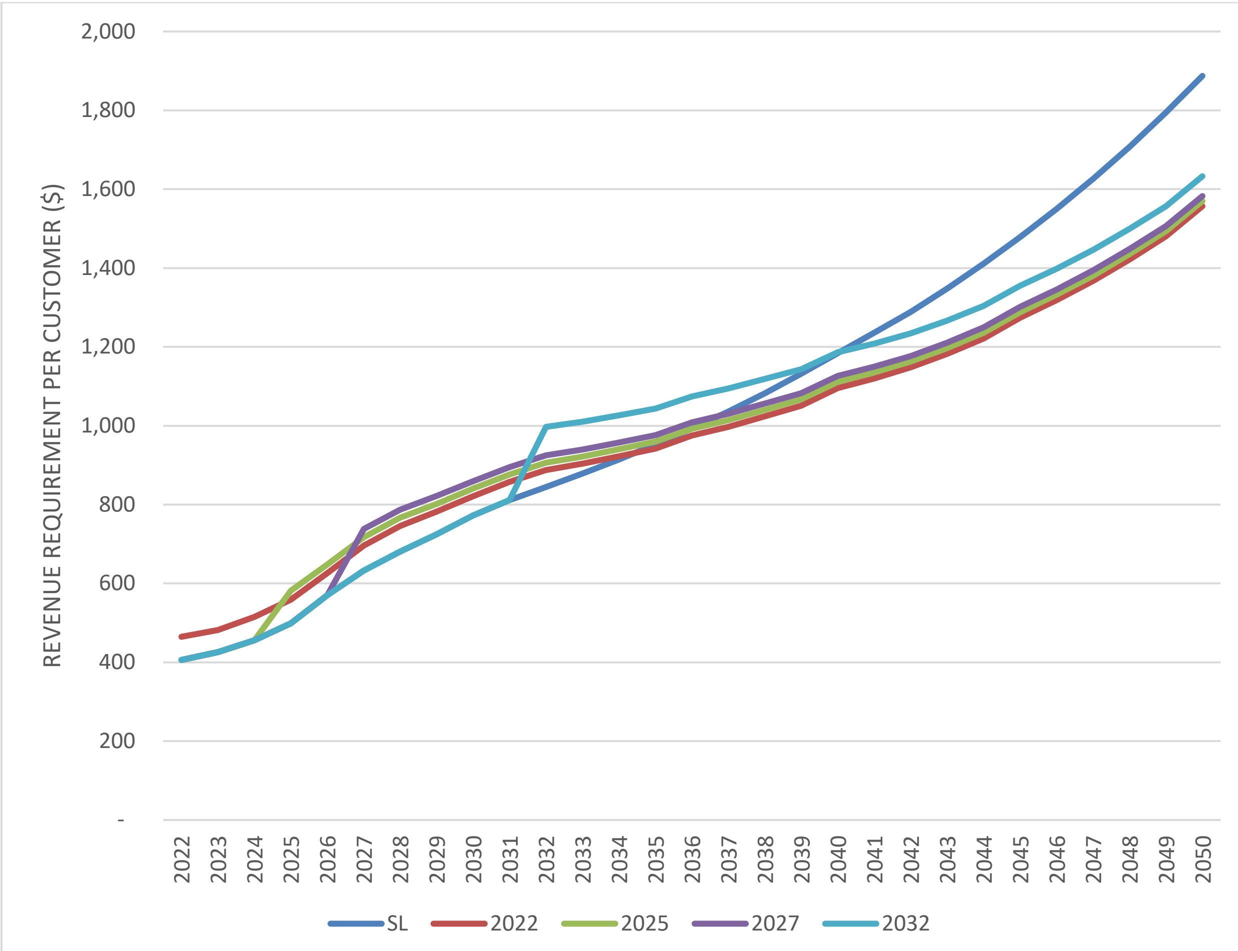


Figure A-8c. Revenue Requirement Per Customer
Based on UoP Implementation Date
Medium Electrification – CEV – Straight Line and UoP (NMPC)



While each of the UoP scenarios produce lower revenue requirements per customer in 2050, there are also costs to waiting to implement the UoP method. While UoP would result in an increase in depreciation expense of more than $50 million in 2022, delaying the implementation of UoP only three years to 2025 causes the increase to grow for NMPC and to double for KEDLI and KEDNY. The increase would be even larger in 2032. The impact of this aspect delaying implementing UoP for the medium electrification – CEV scenario is shown in more detail in the figures below.

Figure A-9a Revenue Requirement Per Customer Increase Based on UoP Implementation Date Medium Electrification – CEV (KEDLI)

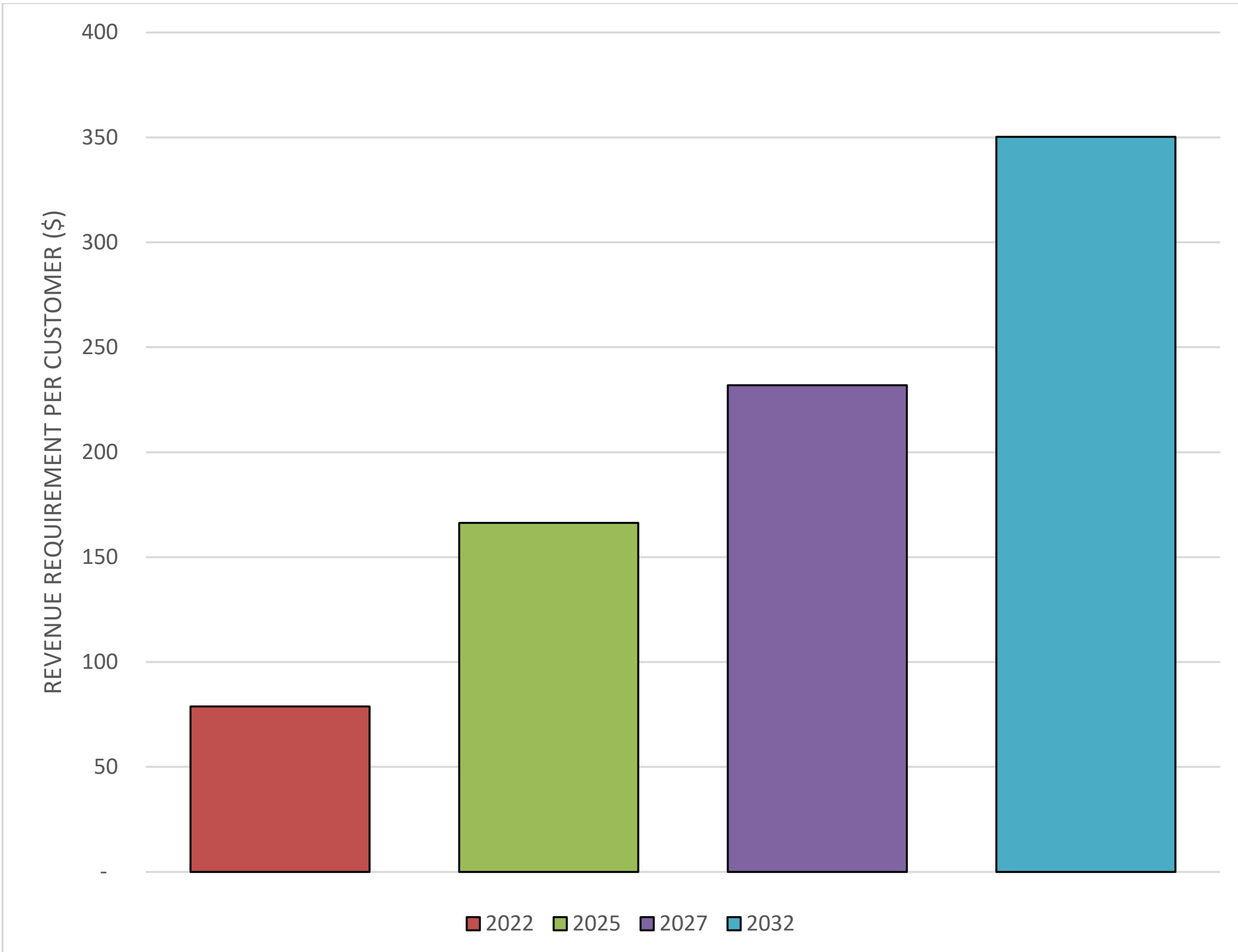


Figure A-9b Revenue Requirement Per Customer Increase Based on UoP Implementation Date Medium Electrification – CEV (KEDNY)

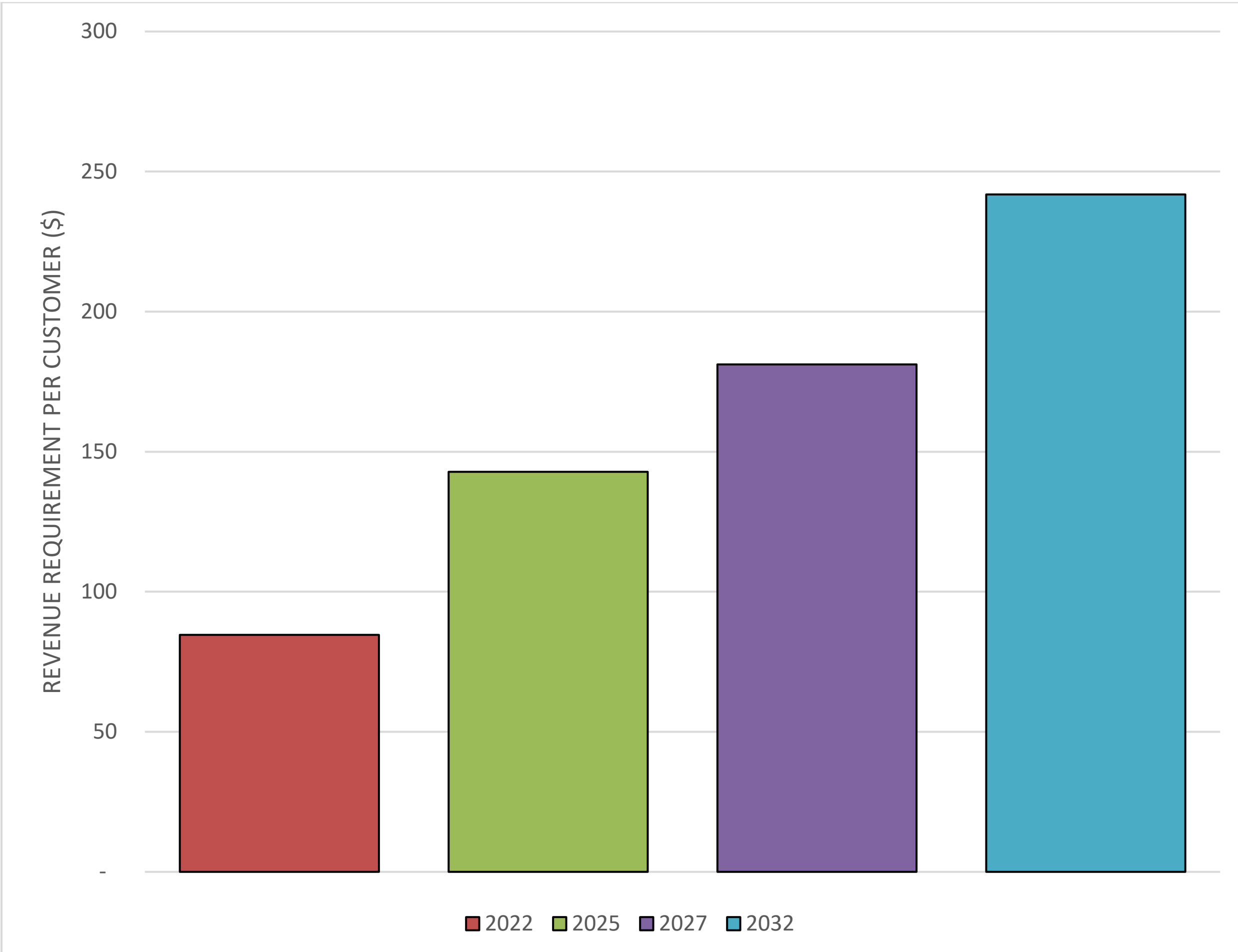
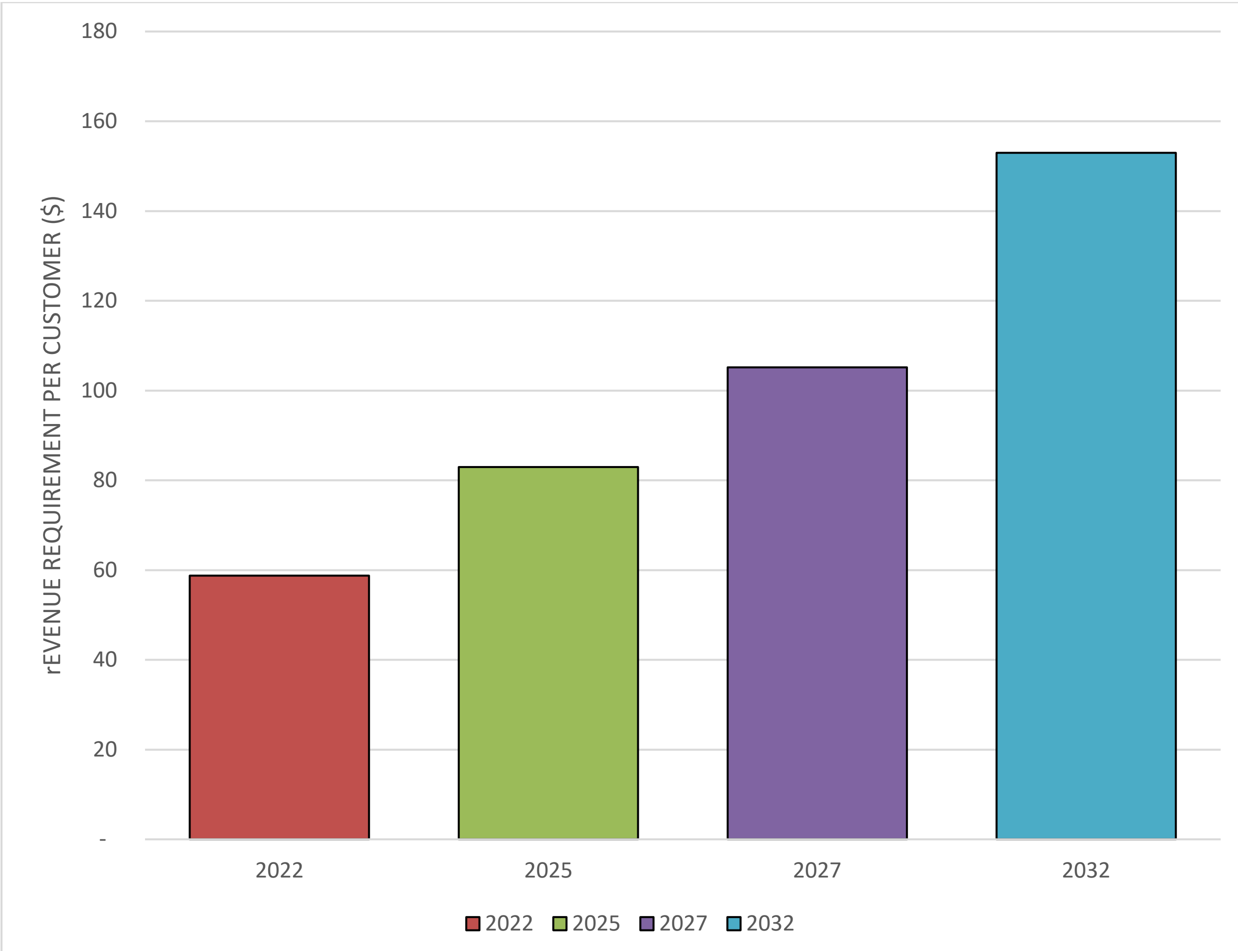


Figure A-9c Revenue Requirement Per Customer Increase Based on UoP Implementation Date Medium Electrification – CEV (NMPC)



These figures demonstrate another long-term dynamic related to depreciation. If there is a need to increase depreciation – if, for example, under an expected set of business assumptions it is most equitable to use the UoP method based on a forecast of declining gas throughput – then the longer it takes to reflect this increase in customer rates the more expensive the change will be for customers. Importantly, the impact will be larger both at the time of the change, as is shown in Figures A-9a, A-9b and A9-c above, and in total over the long run, as can be seen in Figures A-8a, A-8b and A-8c above.

LONG-TERM FORECASTS AND RATEMAKING

The analyses set forth in this report are not intended to be specific ratemaking proposals. Two of National Grid's New York operating companies, KEDNY and KEDLI, are expected to file rate cases in 2023 and the third, NMPC, concluded its most recent rate case in 2021. While the results and conclusions in this report may inform both utilities and policymakers of the estimated long-term impacts of different depreciation approaches under various sets of business assumptions, they differ from the detailed analyses of depreciation, revenues and cost of service that are included in a rate case.

Accordingly, there are several differences between the analyses included herein and an eventual rate case proposal. Aspects of a depreciation study, including the specific detailed service life and net salvage estimates, recovery of leak-prone pipe assets, and specific methods of addressing the CLCPA may be different in a rate case proposal than in the analyses set forth in this report, in part because of the challenges in forecasting these detailed parameters over a thirty year period. Additionally, a rate case develops revenue requirements for a specific number of rate years, all of which occur in the relatively near future. The analysis in this report is based on projections of several variables over the next three decades, which requires both simplifying assumptions and estimates of the future state of National Grid's business.

For these reasons, the results and conclusions of this report should not be interpreted as specific proposals to be used in a rate case. Instead, they are better evaluated as long-term estimates of the impacts different depreciation approaches. Additionally, the study results demonstrate important concepts related to how depreciation scenarios and business assumptions will impact customers over the long-run. These concepts help to inform policy decisions but decisions in rate case proceedings will continue to be informed by the specific facts, circumstances and analyses that factor into each specific case.

OTHER RATEMAKING APPROACHES

The results included in this report provide and assess the impacts of different depreciation approaches – and their impact on revenue requirements and customer bills - to address potential changes to the gas industry over the next thirty years. However, depreciation approaches are not the only means by which the need for a more rapid recovery of capital could be addressed. Historically, there have been a variety of ratemaking approaches used across the utility industry in instances of technological and regulatory changes, such as occurred with the telecommunications industry beginning in the late 1970s and early 1980s, with electric industry restructuring in the 1990s, and with changes to power generation in the 2000s and 2010s. While Gannett Fleming and National Grid do not necessarily endorse any of these as specific solutions for the current circumstances of the gas industry in New York, a survey of potential ratemaking approaches that have been used or considered historically include:

- **"Exit Fees."** A fee paid by a customer who leaves the system in order to pay for their share of the costs of assets constructed to provide the customer service. These could potentially be either paid in full when the customer leaves the system or be incorporated in the customer's electric bills over a reasonable time frame (which could be determined by the New York Commission and the relevant electric utility).
- **Access Fees**. A fee paid by customers to access utility service. For example, during electric industry restructuring, the New York Commission allowed recovery of electric generation stranded costs through access fees for electric distribution service.
- **Trust Fund.** A trust fund is legal entity that contains assets or property on behalf of a person or organization and has been used to fund future capital obligations.

For example, this approach has been used to accrue costs for future obligations such as nuclear decommissioning and is perhaps more familiar for large government obligations such as Social Security. This approach may make the most sense for future removal costs, which may potentially be higher than today's costs in the event large zones or entire systems are decommissioned. The overall cost impact of a trust fund approach can vary depending on the timing of recovery from customers (as a longer time period increases the interest accrued), the timing of payments from the fund to settle obligations, and the sources of funds. As of this writing, the approach appears to have been effective as a long-term mechanism of securing funds for nuclear decommissioning.

- **System Reliability Fees or Carbon Fees.** A fee paid by customers for the purpose of guaranteeing that the system remains reliable and safe during a time of transition to more competitive markets or lower priced service. Such fees could be applied to either gas or, possibly more equitably, electric rates. Further, such fees could perhaps be constructed as a fee on greenhouse gas emissions, thereby providing a price signal on the cost of carbon emissions and encouraging industries to reduce their emissions profile.
- **Securitization**. A process by which state legislation authorizes utilities to receive the right to a stream of income from ratepayers and then backs that cash flow up with the use of Triple-A rated bonds.[43] This is often used after assets are retired and can spread the cost either over a larger set of customers or the greater population. Securitization should also, in theory, have lower financing costs if the obligations are secured, for example, by a taxing authority.

There are potential advantages and disadvantages to each of these approaches, several of which may require legislative action in order to be used by the New York Commission. However, each would require the determination of the portion of rate base to be recovered through an alternative ratemaking mechanism and establish a period of time over which such recovery would be paid. Thus, while there may be differences in financing costs and other aspects of these approaches, they are also similar to depreciation approaches in that two of the primary considerations are the total costs to be recovered and the time period over which recovery occurs.

[43] Congressional Budget Office Paper. Electric Utilities: Deregulation and Stranded Costs, October 1998, pp. 28.

One item of note when analyzing these alternative ratemaking approaches is the incorporation of future cost of removal. Just as depreciation expense includes estimates of future net salvage (and cost of removal) so that customers pay the full cost of the assets from which they receive utility service, any alternative ratemaking approach should incorporate the cost to retire or decommission assets from which they receive service. If, for example, a customer fully electrifies and leaves the gas system, an exit fee (which might be determined based on the proportion of rate base and other costs assigned to the customer based on a class cost of service study) should incorporate not only the rate base but estimates of future removal costs associated with that customer's share of capital costs.